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ENVIRONMENTAL STATEMENT, NAVIGATION IMPROVEMENT HUMBOLDT HARBOR--ETC(U)
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ENVIRONMENTAL STATEMENT

HUMBOLDT HARBOR AND BAY, CALIFORNIA

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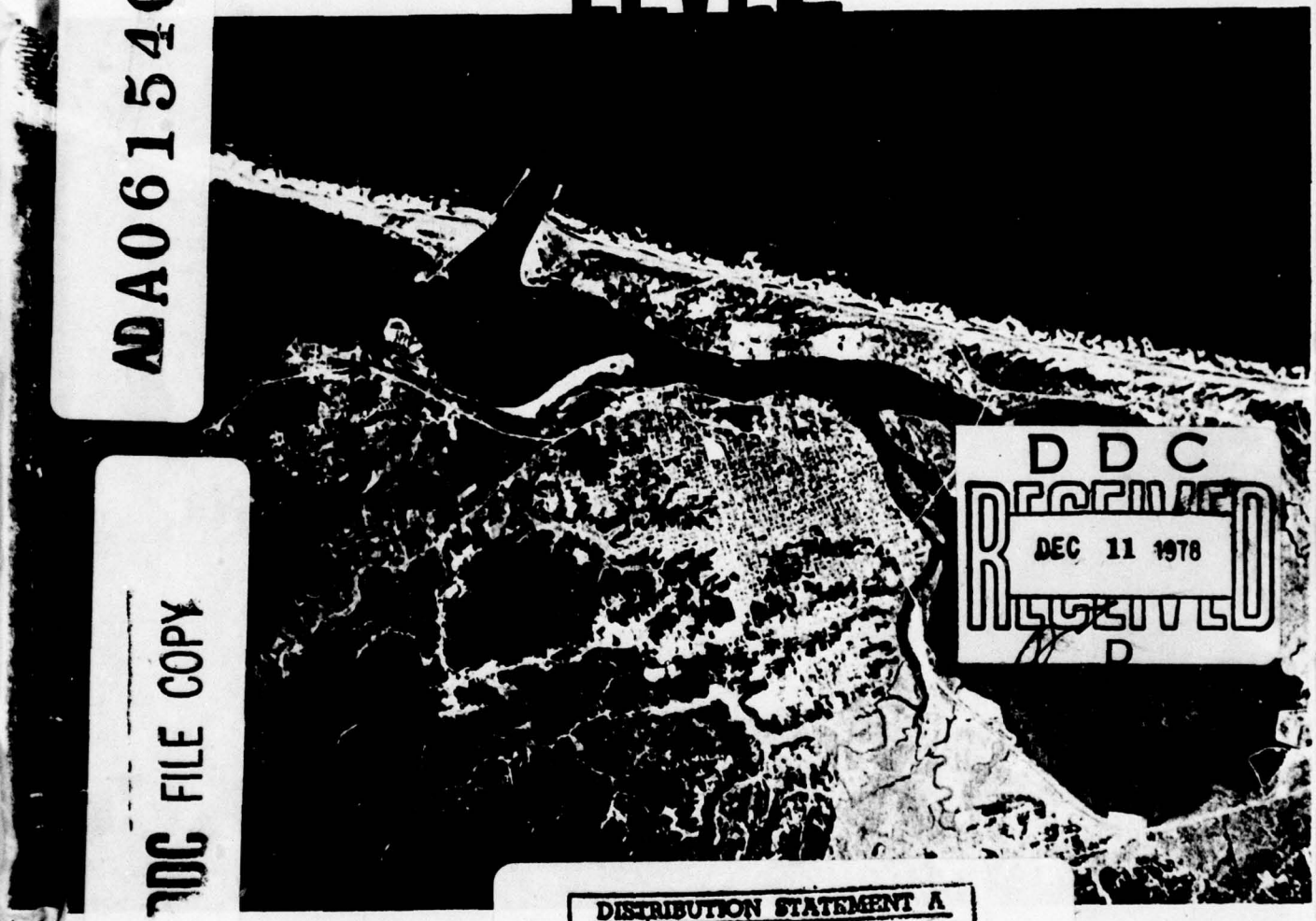

NAVIGATION IMPROVEMENT

U.S. ARMY CORPS OF ENGINEERS - SAN FRANCISCO DISTRICT

AUGUST 1976

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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18. SUPPLEMENTARY NOTES

Design Memorandum No. 1, General Design, Humboldt Harbor & Bay, California, Navigation Improvement and its technical appendices on social, economic, and soils profile data is a companion report

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Environmental Statement, Harbor Development, Navigation Channel, Humboldt Harbor and Bay, California; Dredging.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This Environmental Statement and its Addendums contains environmental profile data and assessments leading to elimination of one land disposal site and selection of two others and a beach disposal site as acceptable for disposal of certain types of hydraulically dredged material. Disposal on beach was also limited to certain seasons of current and biologic migrations.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS
211 MAIN STREET
SAN FRANCISCO, CALIFORNIA 94105

SPNED-E

19 JAN 1977

In accordance with the provisions of the National Environmental Policy Act of 1969, P.L. 91-190, the San Francisco District of the U.S. Army Corps of Engineers has prepared the inclosed final environmental statement for Navigation Improvements to be constructed at Humboldt Harbor and Bay, Humboldt County, California. This final statement was prepared in response to comments on the draft environmental statement which was circulated in March 1976. These letters of comment are reproduced in Appendix 14. Responses to the comments may be found in Section 9.

In November - December 1976 additional information related to disposal areas was developed. One land disposal site (13C) discussed in the final environmental statement was eliminated and two viable alternative disposal areas were evaluated. Discussion of these two alternative disposal areas has been furnished in the Addendum to the Final Environmental Statement.

Detailed plans and specifications will be developed beginning 30 days after the date of this letter or the date of announcement of the statement's availability in the Federal Register, whichever is the later. During this 30 day period, anyone may submit comments on the statement to me at the address given above. Construction is currently scheduled to begin in May, 1977 and to be completed in January, 1979.

Sincerely yours,

1 Inclosure
As stated

H. A. FLERTZHEIM, JR.
Colonel, CE
District Engineer

STATEMENT OF FINDINGS
NAVIGATION IMPROVEMENT
HUMBOLDT HARBOR AND BAY, CALIFORNIA

AUTHORITY AND PURPOSE

I have reviewed and evaluated, in the light of the overall public interest, the final environmental statement and general design memorandum which describe the project in detail. Existing tonnages and trends in oceanborne commerce in Humboldt Harbor have been determined, with a finding that the need for navigation improvements is more critical now than anticipated when the project was authorized in 1968 on the basis of projections and findings set forth in the Project Document (H. D. No. 330, 90th Congress, 2d Session). The economics of the project have been completely reevaluated and I agree that timely initiation of the work of deepening the North Bay Channels from their existing 30-foot depth to their authorized depth of 35 feet is imperative to efficient and safe operation of the harbor in its accommodation of the larger, deep draft vessels now in use for transocean shipment of logs, lumber, wood pulp, chips and other bulk forest products. Economic transportation, particularly waterborne transportation, is fundamental to maintenance of a competitive timber industry and the economic well-being of the five county tributary area of Humboldt Bay and Harbor.

PUBLIC PARTICIPATION

The general need for deeper channels in Humboldt Bay and specific navigation problems have been expressed by the Humboldt Bay Bar Pilots Association and numerous shippers who are incurring added costs and delays from steamer cancellations and more expensive overland freight rates for ship loadings at more distant ports in the San Francisco Bay area. These statements and others on environmental concerns are contained in transcripts of public meetings held in Eureka, California, on 23 May 1961, 8 March 1974 and 7 April 1976 in connection with the authorization studies. I have forwarded copies of the transcripts directly to the Division Engineer and to interested Congressmen. Other copies have been furnished to the local harbor district and local libraries. Certain minor changes in design details and mitigation reflect formal review comments by Federal and Non-Federal agencies and citizen responses to the draft Environmental Statement circulated in March 1976.

RATIONALE FOR DESIGN

I have directed that the rationale for the recommended design be based on evaluation of three main parameters: (a) Social Need, (b) Economics, and (c) Environmental Constraints. The cost of transporting dredged material to a suitable disposal site or sites is the most significant engineering matter relating to project formulation and construction.

Although numerous alternative sites were considered, extensive environmental assessments and evaluations described in this report and the accompanying Environmental Statement have confirmed that approximately 2.2 million cubic yards of material to be removed from project channels with a hydraulic pipeline dredge can be economically deposited on the beach and dune areas in the vicinity of the municipal airport on the Samoa Peninsula with minimum adverse effects. The recommended plan for construction contemplates use of a government-owned hopper dredge, as envisioned in the Project Document, for bend widening in the vicinity of the harbor entrance, where rough sea conditions make use of a pipeline dredge impractical. About 200,000 cubic yards of material below project mile one would be removed in this manner and disposed at EPA approved site SF-3, located about 1.5 nautical miles southwest of the jetties.

ALTERNATIVES

Some of the more significant alternatives considered prior to arriving at the recommended plan are as follows:

a. No-Action. Under this alternative, the project area would remain as is. There would not be any adverse effects from dredging or disposal on natural resources. Inefficient shipping operations from tidal delays, back-tracking to deeper ports and under-utilization of cargo space of the larger vessels would continue. Failure to provide timely improvements in navigation access likely would cause a loss in competitive position of Humboldt Harbor as a shipping terminus for basic forest products and could affect the economic activity of a large timber producing area of northern California. The no-action alternative is not considered responsive to documented need for deeper navigation channels in Humboldt Bay, and is not in the public interest.

b. Scope of Improvement. Under my direction, various increments of channel deepening and widening were considered. The optimum amount of project investment at this time depends on the cost of dredging and disposal and future maintenance, as well as the projected benefits in transportation savings derived from improvement of a particular navigation channel reach or feature. The plan of improvement recommended herein has been found representative of the optimum scope of navigation improvement feasible at this time on the basis of existing and projected waterborne commerce, vessel size trends, operating costs and costs of alternative transport modes.

c. Disposal Alternatives. Constructive use of dredged material could increase total benefit derived from project construction and two possibilities were considered. Some dredged material was found suitable for possible use as embankment fill for a segment of the proposed Eureka freeway. However, this alternative was discarded due to indefinite financing and right-of-way acquisition schedule by the State of California and possibly higher construction costs than with alternative methods.

Deposit of dredged material on an eroding shore area opposite the harbor entrance was rejected because of its greater distance from channels and imperfect knowledge on environmental effects and possible increased shoaling rates. Numerous other potential disposal sites inventoried in the Humboldt Bay Master Plan were progressively eliminated as more costly, unavailable or environmentally unacceptable; until the final iterative process left ocean disposal, beach disposal and land disposal in the vicinity of the airport on the Samoa Peninsula as viable alternatives. I consider these sites to have the least overall adverse environmental effects. The beach disposal site, tentatively recommended in the Draft Report, February 1976, and eliminated in the text of the Final Environmental Statement, August 1976, has been reconsidered as a viable disposal area in addition to the land sites as described in data provided by the Addendum.

MITIGATION MEASURES

I have approved the following mitigation. Salt water effluent from the dredge slurry will contaminate some groundwater resources found as a freshwater lens under the dunes. However, domestic and industrial use of this limited resource has been supplanted by availability of better quality supplied imported from the Mad River. The effect of saltwater percolation through the dune to underlying waters is not considered to be economically significant or irreversible, since rainfall will flush away the saltwater. The Humboldt Bay Harbor, Recreation and Conservation District has agreed to monitor groundwater effects and mitigate any damage by providing hook-ups to municipal supplies for eight residences in Fairhaven that still rely on shallow domestic water wells. The local sponsor has furnished a letter of intent and resolution, in accordance with the provisions of Section 221 of P.L. 91-611. The draft agreement includes provisions that the local sponsor will take certain measures for continued propagation of certain plant colonies (Erysimum menziesii) found on the proposed disposal sites. Specifically, several acres of the plant's habitat will be fenced and reserved for the purpose of monitoring and studying its growth characteristics. Also, various measures designed to reestablish native vegetation on the sites will be performed.

PROJECT IMPACTS

I consider that surface effects of deposit of dredged material on the proposed sites are minor and significantly less than possible adverse effects of other alternative sites considered in this study. Other alternatives considered and evaluated for disposal of dredged material are described in the Environmental Statement and addendum and the General Design Memorandum. No homes or businesses will be displaced by the project. Some wildlife habitat will be degraded from dredged material and salt contamination. The socio-economic impacts of the project on employment and stimulation of the regional economy of the five-county tributary area are definitely positive, compared with the possible adverse effects on local business from loss of competitive port position under the no-action alternative.

CONCLUSION

I conclude that the proposed improvement would allow improved access by deep-draft vessels to existing and potential harbor facilities and allow improvement of the recognized port contribution to employment, business and industrial activity in Northern California. Export of forest products harvested from a large timber growing area tributary to the port has been found significant to the national interest of maintaining a favorable balance of trade. The estimated first cost of the improvement would be $6,600,000. Estimated annual benefits are $697,000 and estimated annual charges are $308,000. The resulting benefit-to-cost ratio is 2.3 to 1.

RECOMMENDATIONS

It is recommended that the United States modify the existing project at Humboldt Harbor, California in accord with the following items (as shown on Plate 2 of the environmental statement):

a. Widen the North Bay Channel at channel bends at Mile 0.75, Mile 2.00, and Mile 2.60;

b. Deepen the North Bay Channel to a depth of 35 feet between Mile 0.75 and Mile 4.29;

c. Deepen the Eureka Channel to a depth of 35 feet between Mile 4.29 and Mile 5.00;

d. Deepen and widen the Samoa Channel between Mile 4.29 and Mile 5.84 by increasing the channel depth to 35 feet and increasing the width to 400 feet; and

e. Provide a turning basin beyond Mile 5.84 at the upper end of the Samoa Channel, 35 feet deep, 1,000 feet wide and 1,100 feet long.

The above items of work would be constructed by the Corps of Engineers provided that, prior to commencement of construction, local interests will undertake certain specific items of local cooperation, as described in the General Design Memorandum.

2 Dec 76
DATE

H. A. FLERTZHEIM, JR.
Colonel, CE
District Engineer

ADDENDUM

TO

FINAL ENVIRONMENTAL STATEMENT
NAVIGATION IMPROVEMENT
HUMBOLDT HARBOR AND BAY, CALIFORNIA (AUGUST 1976)

RE-EVALUATION OF DISPOSAL SITES
13A (LAND DISPOSAL) AND 17 (BEACH DISPOSAL)

U.S. Army Corps of Engineers, San Francisco
211 Main Street
San Francisco, California 94105

DECEMBER 1976

ADDENDUM
FINAL ENVIRONMENTAL STATEMENT (ES)
NAVIGATION IMPROVEMENT
HUMBOLDT HARBOR AND BAY, CALIFORNIA
DECEMBER 1976

This Addendum consists of two appendices, each assessing a disposal site previously discarded during selection of specific disposal areas (Refer Final ES, August 1976, paragraph 6.018). These two disposal sites have been reassessed in detail due to the probable elimination of the previously-accepted site 13C, described in the Final ES, specifically paragraphs 1.006, 4.071, 5.006, and 6.015. Proposals for mitigation to be provided the plant species, Erysimum menziesii, during and after disposal operations at site 13C were not acceptable to the local ad hoc committee formed to evaluate disposal areas. The local ad hoc committee indicated that their best interest concerning the plant species was to avoid even the minimal loss of native habitat within the boundaries of site 13C.

Alternative disposal areas that were marginal during the evaluation prior to selection of disposal sites described in the Final ES were eliminated without consideration of the presence of the Menzies wallflower within site 13C. Taking the position of the local ad hoc committee into account, the marginal disposal alternatives have become more feasible and attractive as disposal areas to replace site 13C.

Information regarding the two disposal areas are included as Appendix A and Appendix B. The Humboldt Bay Harbor Recreation and Conservation District undertook the assessment of a beach disposal site, designated beach disposal site 17. Information on site 17 is found in Appendix B. On the recommendation of the Corps of Engineers, an additional land site, previously designated 13A in the General Design Memorandum, August 1976, paragraph 5-25, was determined to be required in the event beach disposal is limited for any reason. Sites 13A and 13B and beach disposal will be utilized in an optimum manner to provide the most efficient and environmentally acceptable disposal of materials to be dredged. Personnel from the District undertook the assessment for site 13A. Data related to site 13A is found in Appendix A.

Considerations eliminating beach disposal from earlier evaluation included relative proximity of the site to industrial outfalls and a proposed sewage outfall, possible effects on offshore crab fishery, additional survey for archaeological resources, and material distribution after disposal. The original beach site closely investigated was located northwest of Fairhaven, approximately midway from dredging activities between the North Bay Channel and Samoa Channel. The beach

disposal site presently under consideration lies west of Samoa (Refer Appendix B, Fig. 1, location map), in close proximity to dredging activities at Samoa Channel.

Considerations eliminating site 13A from the earlier evaluation included lack of interest from the regional office (Seattle) of the private owner, complex economic considerations due to private ownership, and, at the time of disposal site selection, readily acceptable adjacent land sites 13B and 13C. With the probable elimination of site 13C, contact with the local landowner has indicated willingness to permit a portion of site 13A for disposal purposes.

Both assessments were submitted to the California Coastal Zone and Conservation Commission, North Coastal Region, on 27 November 1976 for permit application of the Humboldt Bay Harbor Recreation and Conservation District to use the disposal areas.

It is noted that project beach disposal will satisfy both standards established by the U.S. Environmental Protection Agency, Region IX, and criteria and recommendations of the California North Coast Regional Water Quality Control Board. Dredged material not satisfying the above criteria will be disposed of on land sites 13A and 13B.

APPENDIX A

ASSESSMENT FOR DISPOSAL SITE 13A

APPENDIX A

ASSESSMENT FOR DISPOSAL SITE 13A
DATA TO BE INCLUDED AS ADDENDUM TO FINAL
ENVIRONMENTAL STATEMENT FOR NAVIGATIONAL IMPROVEMENTS
HUMBOLDT HARBOR AND BAY, CALIFORNIA (AUGUST 1976)

1.0 INTRODUCTION

1.1 Comments to the Draft Environmental Statement, Humboldt Harbor and Bay, California, Navigation Improvement, February 1976, submitted by the California Coastal Zone Conservation Commission (CZCC), North Coast Region, 28 May 1976, and Dr. James Smith, Humboldt State University, 3 June 1976, have merited a re-evaluation of feasible alternate disposal areas for the dredged material. Disposal of sediments as estimated in the Final Environmental Statement (ES), August 1976 are as follows:

Site 13B	1,800,000 cubic yards (estimated capacity)
SF-3 Offshore	190,000 cubic yards (estimated material)
Site 13C	410,000 cubic yards (estimated material)
TOTAL	2,400,000 cubic yards (estimated material)

1.2 The total capacity for dredge disposal upon Site 13C was estimated to be 820,000 cubic yards with diking. However, as indicated, only 410,000 cubic yards is estimated as actual disposal material. The capacity of Site 13C to handle in excess of 410,000 cubic yards was furnished in the event that actual dredging resulted in deposition of more material than anticipated. However, comments concerning the listing of a plant species, Erysimum Menziesii, by the Native California Plant Society in its publication, "Rare and Endangered Vascular Plants of California," and the residency of this plant within the boundaries of Site 13C, have led to reconsideration of the site as a feasible disposal area. The Menzies (western) Wallflower, Erysimum Menziesii, has also been submitted for inclusion in the U.S. Department of Interior's listing of threatened and endangered plants to be published in Spring 1977. Further details related to this plant species may be found in the Final ES, August 1976.

1.3 Although mitigation measures were discussed in the Final ES for the Menzies Wallflower, the local Ad Hoc Committee, formed specifically to evaluate dredged material disposal sites in relation to the presence of the Menzies Wallflower, recommended measures to avoid adverse effects upon the plant population of Site 13C. Their recommendation suggested selection of another disposal area to replace Site 13C and, if possible, a reduction in the disposal capacity of Site 13B where the plant species is found along the fringes of the site's boundaries. Recent meetings

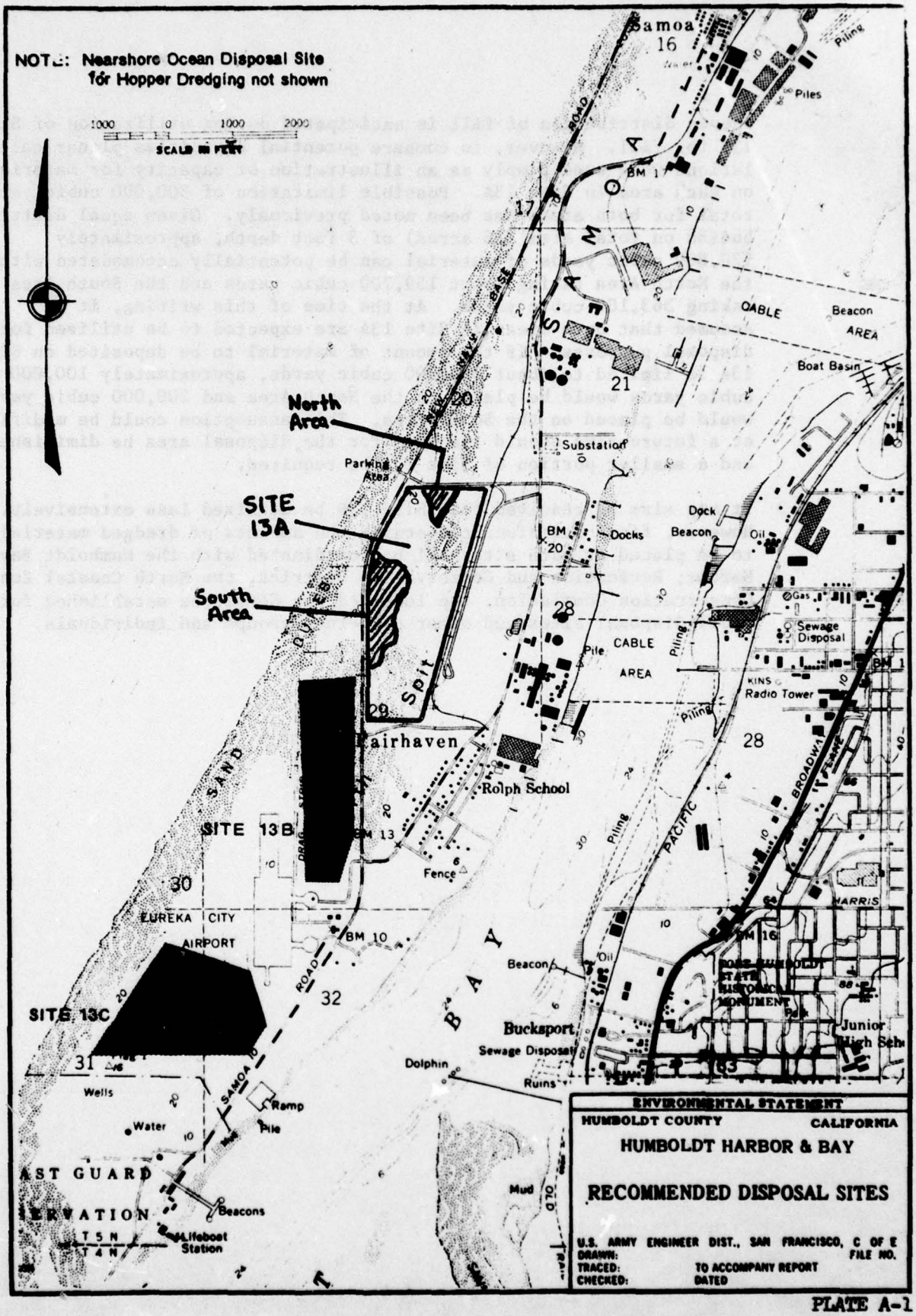
and an on-site inspection of Site 13A conducted by the Ad Hoc Committee resulted in general agreement to seriously consider beach disposal and Site 13A as feasible and prudent alternatives in addition to Site 13B.

1.4 The Humboldt Bay Harbor, Recreation and Conservation District is currently in the process of requesting a permit from the California Coastal Zone Conservation Commission to use three areas for disposal purposes. Evaluation of Site 13B has been previously discussed in the Draft and Final Environmental Statement for navigational improvements in Humboldt Harbor and Bay, February and August 1976 respectively. However, consideration of Site 13A and beach disposal, previously eliminated from the array of disposal alternatives, has been requested by the Humboldt Bay Harbor, Recreation and Conservation District. Each area is to be independently assessed for feasibility for the CCZCC permit application. It is generally understood that both Site 13A and beach disposal are under consideration, and that limitations upon either in the decision making process will, eventually deliniate the final distribution of disposal of materials upon the three prospective sites. The following assessment is related to Site 13A, of which there are two low-lying (at elevations equal to, or less than 10 feet , mean sea level) areas to be designated North Area and South Area. The owners of this parcel of land have indicated that maximum capacity should be limited to about 300,000 cubic yards of material.

2.0 ACTION PROPOSED

2.1 Disposal of dredged sediments from navigation improvements Humboldt Bay (North Bay and Samoa channels) will be placed in Site 13A. A recommendation for disposal of specific amounts of dredged sediments on Site 13A as compared to the beach disposal site will not be addressed in this assessment. Since the beach disposal site is also being evaluated for feasibility, the results fo the beach site assessment will be taken into consideration prior to a final decision concerning distribution of material to be disposed upon the three possible sites: Site 13B, Site 13A and beach site. There are two general areas within Site 13A that are 10 feet, mean sea level or less. One area is located at the northern end of the site, hereafter referred to as North Area, and consists of about 11 acres. The other area is located in the southwestern portion of the site, hereafter referred to as the South Area, and consists of approximately 25 acres. (See attached Plate A-1).

2.2 To determine the total potential capacity of both areas in Site 13A for this assessment, several assumptions were made. Planar calculations using area and average depth figures assumes equal distribution of material throughout both areas in Site 13A. This is not to be the actual condition. Capacities calculated for the land disposal sites (13B-13C) in the Final ES assumed filling and solids accumulating at one end and ponding and draining of water sloping seaward. This


NOTE: Nearshore Ocean Disposal Site for Hopper Dredging not shown
1000 0 1000 2000
SCALE IN FEET
North Area
SITE 13A
South Area
SITE 13B
SITE 13C
Samoa
16
17
21
28
29
30
31
32
Piling
Piles
BM 1
OABLE
Beacon
AREA
Boat Basin
Substation
Parking Area
Dock
Docks
Beacon
Oil
BM 20
Gas
Sewage Disposal
CABLE
AREA
Pile
KINS
Radio Tower
Spit
Fairhaven
Rolph School
SAND
DRAG STRIP
Fence
BM 13
EUREKA CITY
AIRPORT
BM 10
ROAD
SAMOA
BROADWAY
FERNE
PACIFIC
HARRIS
BM 16
Beacon
Oil
Bucksport
Sewage Disposal
Junior High Sch
Dolphin
Ruins
Wells
Water
Ramp
Pile
AST GUARD
ERVATION
Beacons
T 5 N
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Lifeboat Station
Mud
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ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR & BAY
RECOMMENDED DISPOSAL SITES
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
TRACED:
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TO ACCOMPANY REPORT
DATED
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PLATE A-1

uneven distribution of fill is anticipated during utilization of Site 13A for fill. However, to compare potential capacities planar calculations were used simply as an illustration of capacity for materials on each area in Site 13A. Possible limitation of 300,000 cubic yards total for both areas has been noted previously. Given equal distribution on total area (36 acres) of 3 foot depth, approximately 520,800 cubic yards of material can be potentially accomodated with the North Area taking about 159,700 cubic yards and the South Area taking 363,100 cubic yards. At the time of this writing, it is assumed that both areas in Site 13A are expected to be utilized for disposal purposes. If the amount of material to be deposited on Site 13A is limited to about 300,000 cubic yards, approximately 100,000 cubic yards would be placed on the North Area and 200,000 cubic yards would be placed on the South Area. This assumption could be modified at a future time should the need for the disposal area be diminished and a smaller portion of Site 13A be required.

2.3 It may also be resolved that Site 13B be utilized less extensively. However, final decisions concerning the amounts of dredged materials to be placed at each site will be coordinated with the Humboldt Bay Harbor, Recreation and Conservation District, the North Coastal Zone Conservation Commission, the local Ad Hoc Committee established for spoil disposal sites and other concerned groups and individuals.

3.0 SETTING

3.1 Site 13A is located in the Fairhaven industrial area on the North Spit of Humboldt Bay. The site is bounded by Bay Street to the north, another county road to the south, Northwest Pacific railroad tracks to the east, and the New Navy Base Road to the west. The Fairhaven Pulp Mill of Simpson Timber Company lies easterly of the site, the proposed sewage treatment facility of the Humboldt Bay Wastewater Authority lies directly north, Fairhaven lies to the south and the beach lies to the west.

3.2 Common plants observed on the site include, but are not limited to, Lupin, Willow, European dune (beach) grass and Coyote brush (refer to Appendix 2, Environmental Statement, August 1976 for species listing). Populations of the Menzies Wallflower were not apparent in the low-lying areas. Both North and South Areas have been observed during the rainy seasons when standing water has resulted. Evidence of this is shown in an enlarged aerial photograph provided by Simpson Timber Company (Scale 1" = 200', dated 1974) and by on-site observation. Use of Site 13A by wildlife, mainly waterbirds and some mammals species, is common (refer to Appendices 7-8, Environmental Statement, August 1976 for species listing). However no critical habitat-types in the low-lying areas (associated with threatened or endangered wildlife or plant species) were indicated.

3.3 Site 13A has not been experiencing only natural changes, nor has the area been existing in a pristine, unchanging surrounding. Located on private lands in an industrial area for a number of years (recent ownership since 1956), Site 13A has experienced recent fill by the owners and exploratory drilling by the Standard Oil Company of California. A proposed regional sewage facility has been located immediately north of the site.

3.4 Truck traffic on both County and private roads, north and south of the site, from the nearby wood pulp mill to the new Navy Base Road is fairly active (observed during the day). Future use of this area has been designated by the North Coast Regional Coastal Zone Conservation Commission as recreational and industrial by the Humboldt Bay Harbor, Recreation and Conservation District. There were indications that the area is presently used by off-road, recreational vehicles and sportsmen.

3.5 A thorough literature search was performed for the area which included, but was not limited to, examination of maps, records and scholarly publications on file at the District ol Clearinghouse, Department of Anthropology, California State College, Sonoma; Cultural Resource Section, California State Department of Parks and Recreation; Anthropology Library, University of California, Berkeley; Humboldt County Library; Indian Library, Indian Action Council of Northwestern California; Northwestern Indian Cemetery Protective Association, Inc. and the Clark Memorial Museum of Eureka, California.

3.6 Aerial photos of the Eureka waterfront taken by the Corps on 30 November 1972, and aerial photos taken by the Simpson Timber Company in November 1974, were compared and analyzed for possible identification of areal cultural resources. The photos indicated a high degree of disturbance due to contemporary land use patterns and natural flucuations in sand dune topography which have resulted in major modifications to the land surface. There was no indication of the presence of significant cultural resources either within the boundaries of Site 13A or the most probable path of the dredge pipeline.

3.7 Logs of bore samples taken by Winzler and Kelly, Consulting Engineers of Eureka in the parcel of land immediately adjacent to Site 13A to the north were examined to ascertain areal subsurface composition. The probes in that area do not reflect the presence of significant cultural resources.

3.8 Mr. Richard T.Harville, Secretary of the Historical Society, Humboldt County, was contacted over the phone on 23 November 1976, and it was his determination that no significant cultural resources exist within or immediately adjacent to the project area.

3.9 In compl-ance with Section 106 of the National Preservation Act of 1966 (16 USC 470 (f)), the most recent listing of the National Register of Historic Places (Federal Register, February 1976 with monthly supplements) has been consulted and determination has been made that no National Register property, or cultural resources eligible for nomination to the National Register, exist within or immediately adjacent to Site 13A or along the terrestrial dredge pipeline path. No National Register property shall be adversely affected, either directly or indirectly as a result of this project.

3.10 In compliance with Executive Order 11593, "Protection and Enhancement of Cultural Environment" issued 13 May 1971, the California State Historic Preservation Officer has been consulted and it is his determination that no State Historical Landmarks or State Historic Points of Interest shall be adversely impacted, either directly or indirectly, by the proposed project.

3.11 During the week of 15 November 1976, a general surface reconnaissance (on-foot inspection of all land surfaces visable without major modification of vegetation and structural cover) of Site 13A was performed under the field directorship of Mr. Jim Bensen, Archaeological Consultant to the Northwest Indian Cemetery Protective Association, Inc. The survey was performed in accordance with the Society for California Archaeology's recommended procedures for archaeological impact evaluation (King, et.al., 1974). Transsections spaced every 5-10 meters did not encounter data indicative of significant cultural resources. On 22 November 1976, Mr. Ed Kandler, District Archaeologist for the Corps, performed a general surface terrestrial reconnaissance for Site 13A and the most probable dredge pipeline route to the site which entailed 5-10 meter transsections of the site and terrestrial dredge path. There was no indication of the presence of significant cultural resources within or immediately adjacent to Site 13A.

3.12 All data secured during the course of research indicates that the deposition of dredged materials within Site 13A and the transport of dredged materials from the point of origin to the site, will have no dverse or beneficial, direct or indirect impacts on areal cultural resources. Dredged materials will be transported to the site via hydraulic pipeline which will be placed on the surface of the ground. The pipeline will be placed subsurface to the ground only in those areas where it is necessary to prevent obstruction of traffic on local roads. In such instances, damage to potential subsurface cultural resources is considered remote. The initial construction of the roadbed would have severely disturbed resource integrity and decreased research potential. Disposition of materials at the site will be facilitated by means of pumping dredged materials directly onto the surface of the site. The pipeline shall be on the surface of the site and moved dependent upon disposal requirements. No subsurface pipeline intrusion is anticipated within the site. Prior to disposal of dredged materials, recipient areas lacking sufficient natural capacity to contain dredged materials below the designated ten foot elevation will be modified by the construction of dikes using indigenous materials to insure containment. Of the two sub-areas, the South Area appears at this time to be the only area which would require such modification. A dike approximately 10 feet in height and roughly 1,000 feet in length would be constructed by means of bulldozing sand along the westerly segment of the South Area bounded by the Samoa Expressway.

3.13 No program of subsurface testing in support of the general surface reconnaissance was deemed appropriate or necessary at Site 13A. The site is constantly experiencing topographic modification due to natural processes. Large segments of Site 13A, and particularly the low-lying areas designated as North and South Areas, have been severely damaged in historic times due to construction of service roads, landfill, drilling activities and the effects of off the road vehicular traffic. Nevertheless, there is a possibility that subsurface cultural resources may exist within the site, and in those segments of the terrestrial dredge pipeline which will go subsurface areal cultural resources which might exist in these areas, a qualified archaeologist will be present to monitor the construction of retaining dikes at the site and in those areas which will require subsurface transport of dredged materials along the terrestrial pipeline route. Should cultural resources be encountered during construction, operations will be suspended until such time that the respurces may be identified and adequately evaluated. Appropriate coordination with the District 01 Clearinghouse at California State College Sonoma, California State Historic Preservation Officer and the Advisory Council on Historic Preservation would be conducted as expeditiously as possible.

4.0 EFFECTS

4.1 Primary:

a. Dredged material disposal would result in loss of habitat and wildlife species resident in the two areas of site 13A. As pointed out in the final ES, loss of some willow habitat in the disposal area is considered a trade-off necessary for the viability of the project, but does not represent total loss of the local habitat-type. This is still the case considering disposal site 13A. Total surface area to be affected by utilization of the entire area available for about 300,000 cubic yards of material in site 13A is about 30-36 acres. Replanting of the area will be undertaken as described for site 13B in the final ES.

b. General data for the entire North Spit as discussed in the final ES has indicated that there is a high infiltration capacity. Disposal of a slurry containing excess water would, therefore, result in low run-off potential. However, due to the presence of standing water in the low-lying areas of site 13A during rainy periods, disposal of the dredged slurry may alter the composition of standing water during fi-ling operations. A localized seasonal high run-off potential may exist in the North and South areas. Drainage to the ocean will be facilitated. A dike, approximately 10 feet in height will be placed around the two areas of 13A to allow ponding capability. Design and function of the diking will be similar to that required for site 13B. Specifications for the diking and filling of this area can be obtained from the Navigation and Coastline Section, San Francisco District, Corps of Engineers.

c. The route of the pipeline system when crossing Bay waters and when lying on land except crossing below roads has not indicated any problems related to rights-of-way and easements. Tehre will be local disturbance of some habitat adjacent the pipeline and in areas where subsurface placement is required. These effects are considered a minor impact and would be temporary in nature.

4.2 Secondary:

a. Non-use of affected habitat areas by trnasitory or migratory wildlife species would result in additional use of similar habitat nearby. Eventual use of disposal areas is expected to occur over a long-term period by tolerant species and with replanting.

b. Possible secondary effects to the local groundwater may occur. The extent of this secondary effect is considered to be minor in nature since site 13A is located in a more isolated industrial area than 13B and 13C. Discussion with Humboldt Bay Municipal Water District indicated that most Fairhaven residents are presently connected to the Water District distribution system and that the entire area will be serviced by the Water District in the near future. Further detailed discussion related to groundwater may be found in the final ES.

c. As mentioned in the final ES, placement of the dredged material on the North Spit land disposal sites would have effects on any of the proposed future uses of the land. Aesthetic value may be degraded for recreational use, although use by off-road, recreational vehicles may be enhanced. Wildlife would initially make less use of the site. Future industrial use would be enhanced by possible limited fill. These effects would also be applicable to site 13A.

5.0 ADVERSE EFFECTS THAT CANNOT BE AVOIDED

5.1 Modification of about 30-36 acres of coastal strand habitat is expected with disposal on site 13A. A temporary elimination of wildlife and human use is expected prior to revegetation and probable habitat modification. However, in comparison to other land disposal areas on the North Spit, site 13A is more favorable in relation to preservation of the Menzies Wallflower.

6.0 Alternatives

6.1 Disposal alternatives have been discussed previously in the final ES. As previously mentioned, the beach disposal site and land site 13A have warranted further analysis due to local intentions to preserve and maintain viable populations of the Menzies Wallflower residing in disposal site 13C.

7.0 Coordination

a. Bill Seidel, Cultural Resource Section, California State Department of Parks and Recreation.

b. District 01 Clearinghouse, Department of Anthropology, California State College, Sonoma.

c. Curator, Clark Memorial Museum, Eureka, California (24 November 1976).

d. Jim Benson, Archaeological Consultant, Northwest Indian Cemetery Protective Association, Inc. (22 November 1976)

e. Jack Alderson, Chief Executive Officer, Humboldt Bay Harbor, Recreation and Conservation District.

f. Marilyn Miller, Biologist, Winzler & Kelly, Consulting Engineers, Eureka, California. (24 November 1976)

g. Bon Kelly, Winzler and Kelly. (24 November 1976)

h. Charles Evers, Forest Division, Simpson Timber Company. (22 November 1976)

i. Rick Rayburn, Conservation and Development Analyst, Northcoast Coastal Zone Conservation Commission. (23 November 1976)

j. Larry Worden, Wildlife Refuge Manager, U.S. Fish and Wildlife Service. (23 November 1976)

k. Paul Kelly, Wildlife Biologist, California State Department of Fish and Game. (23 November 1976)

l. Gary Brookman, Environmental Research Consultants, Inc. (23 November 1976)

m. Humboldt Bay Municipal Water District. (23 November 1976).

n. Mr. Mayberry, Humboldt Bay Waste Water Authority. (23 November 1976)

o. Robert Davenport, Chairman and Dr. James Gast, Co-Chairman, Ad Hoc Committee.

APPENDIX B

BEACH DISPOSAL ASSESSMENT

PREPARED FOR HUMBOLDT BAY HARBOR RECREATION AND CONSERVATION DISTRICT BY

ERC OCEANOGRAPHY
NOVEMBER 1976

HUMBOLDT BAY
HARBOR, RECREATION, AND CONSERVATION
DISTRICT
(707) 443-0801
P. O. Box 134
Eureka, California 95501

November 26, 1976

Colonel Henry A. Flertzheim
Corps of Engineers
211 Main Street
San Francisco, California 94105

Dear Colonel Flertzheim;

Enclosed please find the Environmental Statement Addendum as prepared by ERC Oceanography on beach disposal site number 17.

Very truly yours,

Jack B. Alderson

Jack B. Alderson
Chief Executive Officer

JBA/slw

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I. PROJECT DESCRIPTION

A. AUTHORIZATION

The Humboldt Bay Navigational Improvement Plan is described in House Document Number 330, 90th Congress, 2nd Session and construction was authorized by the River and Harbor Act of 1968 (P.L. 90-483). The Humboldt Bay Harbor Recreation and Conservation District is the sponsoring agency for the improvement project. The District also authorized this addendum to the Final Environmental Statement as prepared by the U. S. Army Corps of Engineers (1976).

B. PURPOSE

This addendum is drafted and submitted in accordance with the requirements of the National Environmental Policy Act (P.L. 91-190) and the California Environmental Quality Act. Furthermore, this addendum is necessary because an alternative disposal site only briefly mentioned in the Final Environmental Statement is now highly recommended by the *ad hoc* advisory committee for the Humboldt Bay Navigational Improvement Project for dredge spoils disposal. Minutes of the meetings of October 19, 1976 and November 17, 1976 are attached (Appendix 1).

C. PROJECT DESCRIPTION - DIMENSIONS

The detailed project description and dimensions are described in the Design Memorandum Number 1 and the Final Environmental Statement (U. S. Army Corps of Engineers, August 1976). This addendum discusses only impacts associated with dumping of dredge spoils on a proposed beach site, and impacts associated with the construction and placement of the pipeline for transporting spoils material west of the New Navy Base Road (Samoa Boulevard).

D. DREDGING

Dredging operations are described in Section 1.004 E of the Final Environmental Statement by the U. S. Army Corps of Engineers.

E. RE-VEGETATION

The mitigation procedure of re-vegetation as described in the Final Environmental Statement may not be necessary. The disposal site, being sandy intertidal, lacks vegetation entirely. The proposed pipeline route is sparsely vegetated and very little disturbance is postulated.

II. ENVIRONMENTAL SETTING

A. GENERAL DESCRIPTION

The Samoa Peninsula, or North Spit, forms the western side of the northern portion of Humboldt Bay (Figure 1).

The project site consists of a disposal area on the beach of the Samoa Peninsula and a delivery pipe route across the Samoa Peninsula from Humboldt Bay to the disposal area.

The disposal area represents a small portion of a uniform, sandy beach which stretches from the mouth of the Mad River to the entrance of Humboldt Bay (Figure 1). The delivery pipe route follows a beach access road. The access road is located just north of the community of Samoa and directly west of the Samoa elementary school. The road, though not paved, is well maintained. It is constructed of gravel and wood chips. The road ends at the base of a large plateau of hard packed sand and wood chips, the remains of a former bark dumping area. On the west side of the plateau there is a gulley which contains a pipeline of the Humboldt Bay Municipal Water District.

West of the water pipeline there is a single row of beach grass - covered foredunes. The beach is situated just beyond the foredunes. The width of the beach is contingent upon beach slope which varies according to season and weather and surf conditions.

B. GEOLOGY

1. Seismicity

Seismicity of the Humboldt Bay Area has been discussed in sections 2.050 through 2.052 of the Final Environmental Statement (U. S. Army Corps of Engineers 1976). The Freshwater Fault, considered to be active by some geologists, crosses the North Spit approximately ten miles north of the ocean disposal site.

A north to northwest trending, asymmetric fold of the oldest sediments is the predominant offshore geologic structure. This fold, or anticline, is bordered on the north by a parallel, discontinuous feature designated as the North Spit Fault. The fault is considered inactive and should not be a significant feature affecting location or design considerations (Converse, Davis, Dixon and Associates 1976).

2. Offshore Sediments

As part of the Humboldt Bay Wastewater Authority Sewage Outfall

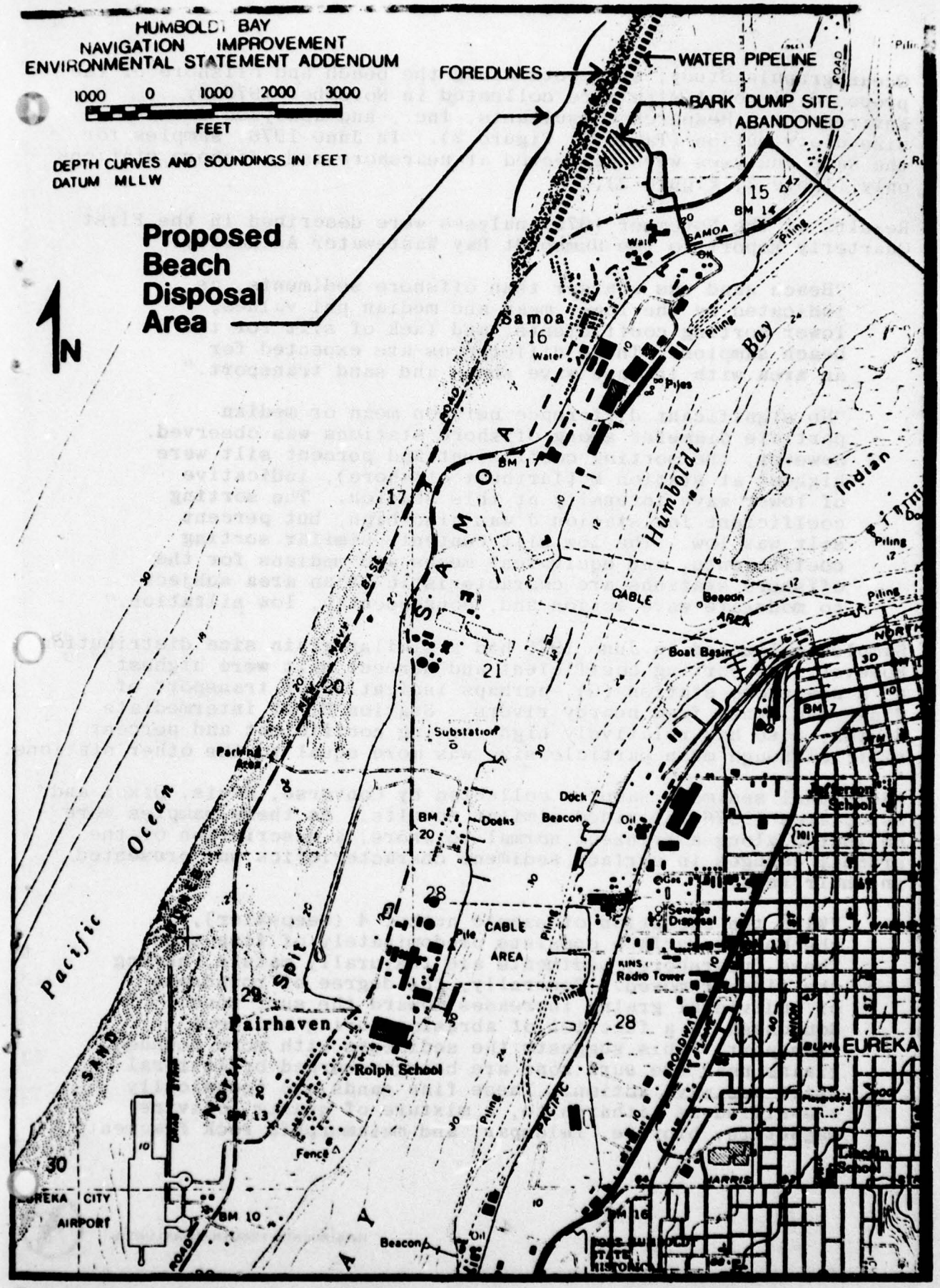

Figure 1. Proposed beach disposal area

Oceanographic Study, sediments along the beach and offshore of the proposed disposal site were collected in November 1975 by Environmental Research Consultants, Inc., and analyzed for grain size distribution (Table 1, Figure 2). In June 1976, samples for the same analyses were collected at nearshore and offshore stations only (Table 2, Figure 2).

Results of the November 1975 analyses were described in the First Quarterly Report to the Humboldt Bay Wastewater Authority:

> "Beach sand was coarser than offshore sediments, as indicated by the lower mean and median phi values, lower sorting coefficients, and lack of silt for the beach samples. These differences are expected for an area with intense wave shock and sand transport."
>
> "No significant difference between mean or median particle diameter among offshore stations was observed. However, the sorting coefficient and percent silt were highest at station M (farthest offshore), indicative of lower wave intensity at this station. The sorting coefficient for station J was also high, but percent silt was low. The low silt content, similar sorting coefficients, and equivalent means and medians for the offshore stations are characteristic of an area subject to moderate wave action and, consequently, low siltation."

Samples collected in June 1976 had a similar grain size distribution However, the sorting coefficient and percent silt were highest at a nearshore station (G), perhaps indicative of transport of finer sediments from nearby rivers. Station B, at intermediate depths, also had relatively high sorting coefficient and percent silt, although mean particle size was more equal to the other stations.

Additional sediment samples collected by Converse, Davis, Dixon and Associates (1976) provided similar results. As these samples were collected along a transect normal to shore, a description of the gradual changes in surface sediment characteristics was presented in their report:

> "With the exception of sample number 4 (deepwater), the bottom surface consists predominately of fine sand. These (nearshore) sediments are texturally mature, having the fines removed. Generally, the degree of roundness of individual grains increases toward the surf zone. Roundness is a function of abrasion during sediment transport. This suggests the sediments with more rounded grains near the surf zone are being reworked by littoral drift and wave action. These fine sands are technically classified as litharenite, a mixture of quartz, olivine, magnetite, biotite, feldspar, and metamorphic rock fragments."

TABLE 1. MEAN (Mφ) AND MEDIAN (Mdφ) GRAIN SIZE, STANDARD DEVIATION (σ_I), AND PERCENT SILT IN SEDIMENT SAMPLES FROM BENTHIC AND BEACH STATIONS (NOVEMBER 1975)

Station	Mφ	Mdφ	σ_I	Percent Silt (finer than 4φ)
A	2.78	2.75	0.50	3.2
AB	2.82	2.78	0.44	3.3
AC	2.83	2.72	0.36	2.8
B	2.80	2.78	0.45	2.7
C	2.71	2.69	0.38	1.6
G	2.65	2.62	0.47	3.7
J	2.73	2.74	0.51	2.5
M	2.77	2.75	0.58	3.8
D	1.87	1.80	0.27	0
K	1.86	1.85	0.28	0
L	2.02	2.02	0.27	0

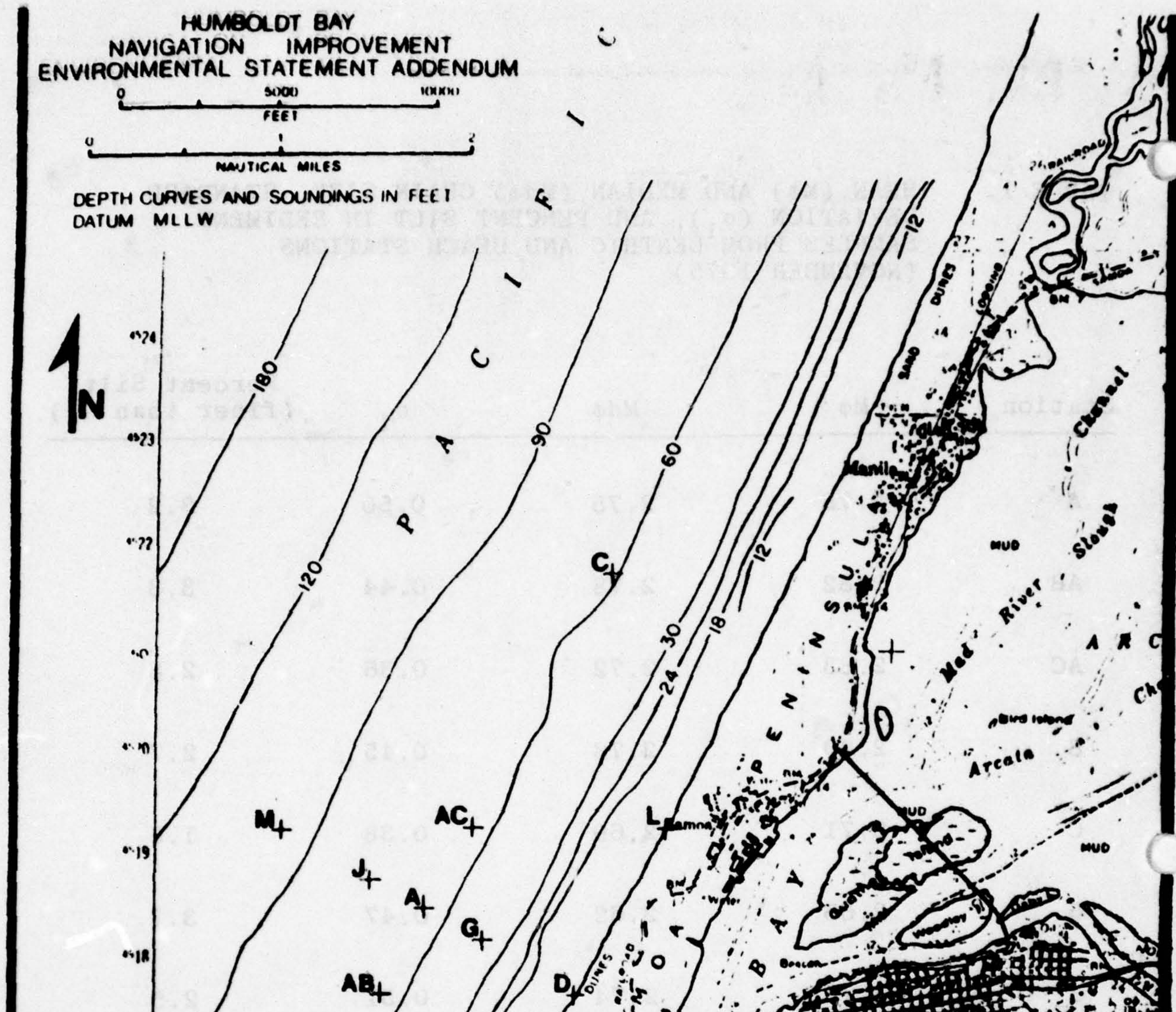

Figure 2. Sampling stations used in Humboldt Bay Wastewater Authority Oceanographic Study

TABLE 2. MEAN (Mφ) AND MEDIAN (Mdφ) GRAIN SIZE, STANDARD DEVIATION (σ_I), SKEWNESS, AND PERCENT SILT IN SEDIMENT SAMPLES FROM BENTHIC STATIONS (JUNE 1976)

Station	Mφ	Mdφ	Sorting σ_I	Skewness	Percent Silt (finer than 4φ)
A	2.82	2.81	0.47	+0.06	2.6
B	2.79	2.75	0.50	+0.20	3.8
C	2.76	2.75	0.40	+0.05	1.3
AB	2.76	2.71	0.45	+0.19	1.9
AC	2.76	2.73	0.45	+0.18	2.6
G	2.96	2.92	0.59	+0.11	5.7
J	2.66	2.66	0.49	+0.02	1.2

"The material collected at sample location number 4 is considerably finer-grained. This very fine, sandy mud is texturally immature (containing clay and silt) and is very poorly sorted. The only grains that could be identified in hand specimen were quartz and magnetite. Because of the slightly cohesive nature of the sandy mud, the very thinly laminated structure was retained during the sample retrieval. This structure consists of alternating, horizontal 1/4 to 1/2 inch (6 to 12 millimeter) thick layers of silt, sandy silt and minor clay."

3. Dune Sands

Recent dune sand deposits are described in U.S.G.S. Water Supply Paper 1470 (1959):

"The area along the coast is marked by an almost continuous strip of beach sand and typical windblown, shifting dune sand. This strip is broken at the south end by the mouth of the Eel River, in the center by the dredged entrance to Humboldt Bay, and at the north end by the mouth of the Mad River. The dunes are best developed along the North Spit between the entrance to Humboldt Bay and the mouth of the Mad River, where they reach an altitude of more than 70 feet and attain a maximum width of three-fourths of a mile. The dune sand is loose, subangular to subrounded, fairly well sorted, fine to coarse grained, and gray or brownish gray. The base is not exposed, and no wells are known to penetrate the full thickness of the deposit. Therefore, the thickness is uncertain, but it may be more than 100 feet."

"On North Spit the dune and sand forms an important aquifer."

4. Groundwater

Groundwater characteristics for the Humboldt Bay region are discussed in sections 2.044 - 2.049 of the Final Environmental Statement (U. S. Army Corps of Engineers 1976). Specific discussions of groundwater in the North Barrier Spit (Samoa Peninsula) are included in sections 2.046, 2.048, and 2.049.

The U.S.G.S. collected and analysed three samples of water from dune sand near Samoa in 1959. Results from the analyses are described in U.S.G.S. Water Supply Paper 1470:

"Even though the analyses of waters from the dune sand represent samples from a small area, it is reasonable to

assume that these analyses are typical of the general chemical character of fresh water from wells in the North Spit. The water is of the sodium chloride type, and the 4 samples had chloride concentrations that ranged from 69 to 145 ppm. Iron concentrations in 3 of these samples ranged from 0 to 0.6 ppm. When water from a well in the North Spit becomes contaminated with sea water, the well is abandoned and a new one is constructed."

"The sodium chloride in the water of the dune sand is due (a) largely to the diffusion of salt water across the interface between the fresh water lens and the salt water and (b) also to the precipitation, which dissolves salts deposited by ocean spray and subsequently percolates downward to the fresh water lens."

5. Tsunami Potential

Tsunami potential is described in section 2.054 of the Final Environmental Statement (U. S. Army Corps of Engineers 1976).

6. Liquefaction Potential

Liquefaction potential for the dredging sites is described in section 2.053 of the Final Environmental Statement (U. S. Army Corps of Engineers 1976). Liquefaction of offshore sediments is discussed in detail by Converse, Davis, Dixon and Associates (1976). Because liquefaction potential is generally associated with cohesionless, unconsolidated, saturated, fine-grained sandy sediments, it will increase with distance from the shore as sediments become more fine grained. However, liquefaction associated with storm wave motion rather than earthquake ground shaking may be more of a problem near the beach.

C. TERRESTRIAL RESOURCES

1. Vegetation

The pipeline route traverses a coastal dune environment that has been subjected to heavy human use. The dune system is subjected to rigorous physical and climatic conditions resulting in a dynamic process of colonization, stabilization, and erosion. Humboldt coastal dune dynamics and vegetation have been analyzed by Parker (1974). Parker's analysis was extended to the dunes in question in the Eureka-Arcata Sewage Facility draft Environmental Impact Report prepared by Environmental Research Consultants, Inc. (1974).

Erysimum menziesii (wall flower) is found in the area of the proposed delivery pipe route. *E. menziesii* is listed by the California Native Plant Society and the Smithsonian Institute as rare and endangered.

2. Wildlife

The fauna of the proposed delivery pipe route is described in the Final Environmental Statement (U. S. Army Corps of Engineers 1976). Four species of birds reported in the area are listed by the U. S. Department of Interior and the California Resources Agency as rare and endangered, the clapper rail, the peregrine falcon, the California brown pelican, and the southern bald eagle. None of the rare and endangered bird species are dune or open beach residents. No rare and endangered mammals, reptiles, or amphibians are found in the project area. A species list of the fauna of the area is included in the Final Environmental Statement (U. S. Army Corps of Engineers 1976).

D. INTERTIDAL RESOURCES

1. Invertebrates

The sandy beach, intertidal zone is a very restrictive habitat. Only motile forms capable of rapid burrowing and survival during low tide exposure to air can survive. Allen (1964) found nine species at five intertidal stations along a transect on the Samoa Peninsula which was sampled yearly from 1958 through 1961. A beach sampling program conducted by Environmental Research Consultants, Inc. (1976a) approximately one-half mile from the proposed disposal site revealed nine species near or at the low tide level. A composite species list is appended (Appendix 2).

2. Birds

Shore birds feed all along the beach. Many pipers and similar species follow the retreating tide to feed on invertebrates and small fish. These feeding populations range for miles north and south of the proposed disposal site.

E. SUBTIDAL RESOURCES

1. Invertebrates

Several investigations in recent years have focused on the invertebrate populations offshore of the Samoa Peninsula.

Allen (1964) sampled a transect of Samoa at 42', 102', and 216' for three years beginning 1959 and ending 1961. His samples were

dominated by molluscs (razor clams), polychaetes, and crustaceans (Appendix 3). Allen (1964) noted that sediments of fine to silty sand contained the highest percent biomass. Annual variations in species composition and abundance indicated that the invertebrate populations are highly mobile.

During a pulp mill outfall survey, four stations were sampled monthly from June 1965 to March 1970. The stations were located north and south of the Crown Simpson outfall and north and south of the Louisiana Pacific (formerly Georgia Pacific) outfall in 42 - 48 feet (DeMartini 1970). DeMartini reported that distribution of organisms appeared to be aggregated and that faunistic changes are related to natural changes in the sediment type. He characterized bottom sediments as ranging from "a mixture of sand and fine gravel to a fine silty sand." A species list of benthic infauna is included in Appendix 3.

Benthic infauna offshore of the Samoa Peninsula were sampled from November 1975 to September 1976 (Environmental Research Consultants, Inc. 1976a). Five stations were sampled quarterly, two stations sampled biannually, and one station was sampled once. Stations were located in 48' - 100' of water.

Species composition and abundance fluctuated seasonally and aggregation was noted. Sediments ranged from fine sand to coarse sand with small amounts of silt. A composite species list is included in Appendix 3.

2. Fish and Fisheries

a. Nearshore Fish Populations

Three intensive studies of demersal fish populations offshore from Samoa have been conducted in recent years. Allen (1964) reported and discussed trawl data collected from 1959 to 1962; Allen (1970) reported five years of quarterly trawl data as part of the Georgia Pacific-Crown Simpson Pulp Mill biological survey; and Environmental Research Consultants, Inc. (1976b) has collected and statistically analysed four quarters of trawl data as part of the Humboldt Bay Wastewater Authority Oceanographic Study. Species that were common and abundant in all three surveys are butter sole *(Isopsetta isolepis)*, night smelt *(Spirinchus starksi)*, Pacific tomcod *(Microgadus proximus)*, and pricklebreast poacher *(Stellerina xyosterna)* (Appendix 4).

A recurrent group analysis performed on data from all 144 trawls conducted in the three surveys revealed three major groups of fishes occurring offshore from Samoa (Figure 3). Of these, Group I predominated, comprising the most abundant and frequently occurring fishes in the nearshore waters. Shiner perch *(Cymatogaster aggregata)*, whitebait smelt *(Allosmerus elongatus)*, and black rockfish *(Sebastes melanops)*, were associated loosely with Group I. Fishes that were collected in the study area but did not show up in the recurrent

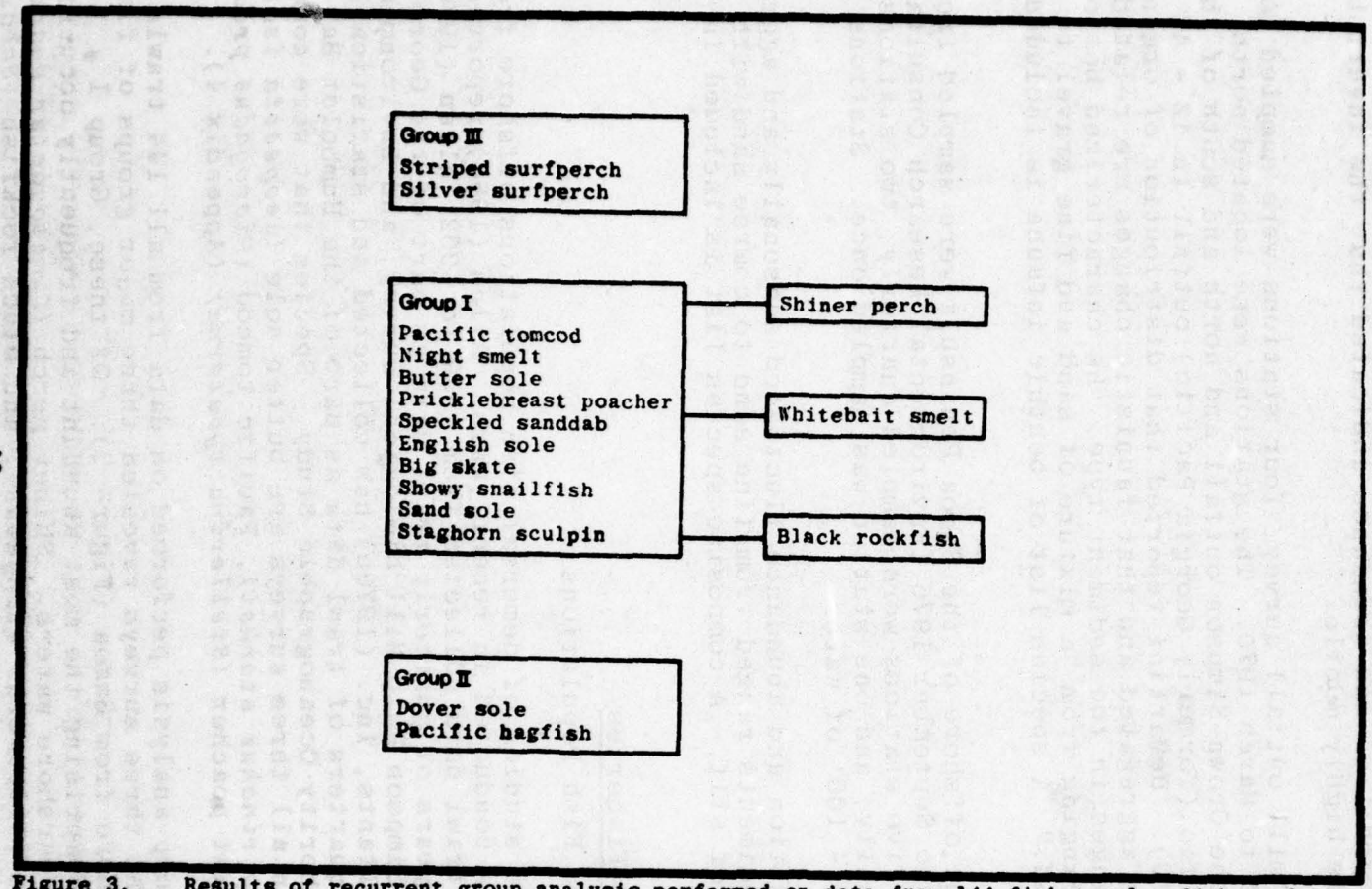

Figure 3. Results of recurrent group analysis performed on data from 144 fish trawls offshore from Samoa. Group I, with shiner perch, whitebait smelt, and black rockfish loosely associated predominates in the nearshore waters (ERC, 1976b). Species listed in order of dominance within groups.

roup analysis can be considered transients which do not show any major associations with other fishes in the study area.

b. Commercially Important Species

Fishes - Important commercial fishing grounds lie immediately off shore from the disposal area (Environmental Research Consultants, Inc. 1974). Present data and past studies (Allen 1964, 1970) indicate that large populations of harvestable commercial fish are not prevalent in the proposed disposal area. However, these studies do show that the area contains many juvenile fish of commercially important species, as well as adult populations of surf smelt, night smelt, and whitebait smelt.

Commercial species commonly found in the disposal area are night smelt, surf smelt, whitebait smelt, English sole, butter sole, sand sole, Pacific sanddab, and black rockfish. Commercial landings for these species for the port of Eureka were valued at $494,000 in 1973. Rockfish accounted for $244,000; English sole for $98,000; smelt for $84,000; sanddabs for $65,000; and sand sole for $4,000 (California Fish and Game).

Most flatfish found offshore from Samoa are juveniles; larger flatfish are more common in deeper water. Adult and juvenile smelt are common throughout the disposal area, although surf smelt re more common in shallow water. Black rockfish are highly mobile and tend to aggregate; therefore, present data do not accurately characterize their distribution.

Commercial species less frequently encountered in the disposal area are northern anchovy, Pacific herring, Pacific hake, salmon, various surf perches, lingcod, starry flounder, Dover sole, and petrale sole. These species probably occur in the disposal area, but only for brief portions of their life cycles (Allen 1964, 1970).

Allen (1964) conducted mid-water trawls between Humboldt Bay entrance and the disposal area to collect information on juvenile fish occurrence and abundance in nearshore waters. His results indicated that large numbers of juvenile flatfish, smelt, and rockfish reside in the water column north of Humboldt Bay.

Dungeness crab - Dungeness crab, *(Cancer magister)*, is fished commercially in the nearshore waters outside Humboldt Bay. Most crabs are taken at depths of less than 55 meters; many are collected in the proposed disposal area. Although the annual commercial crab catch varies extensively, the fishery is a major source of income for the Eureka area. From 1960-1969, dungeness crab harvest averaged 3,200,000 pounds per year, at a wholesale value of over $600,000 per year (Environmental Research Consultants, Inc. 1974).

As indicated by commercial catch data from 1953-1975, the local crab population size varies with an apparent six to ten year cycle (Figure 4). The oscillations are probably natural, but made more severe by local fishing efforts. Because *C. magister* requires two to three years of growth to attain legal size (Butler 1960), recruitment is probably lowest when the adult population is at its maximum, and highest when the population size is minimum (Figure 4).

Investigations of the local crab population in the disposal area are limited to those of Allen (1964, 1970) and Environmental Research Consultants, Inc. (1976b). Because of the different sampling techniques employed, direct comparisons of data from these studies are not possible. However, conclusions and inferences can be drawn from data generated in each study, or by each method, and applied to a general description of crab population of the study area.

Recent trawl data show that the study area supports a large juvenile crab population (Environmental Research Consultants, Inc. 1976a,b). This is in agreement with data from Allen (1970) and supports the contention that the proposed sewage outfall study area is a nursery ground, or part of a nursery ground, for juvenile dungeness crab. Further, Allen (1964), using crab pots and ring nets, found adult females progressively more abundant northward from Table Bluff, indicating that spawning may also be significant offshore from Samoa.

F. OCEANOGRAPHY

1. Nearshore Currents

Nearshore surface currents in the vicinity of Samoa are dominated by the California Current system, coastal upwelling, and, to a smaller extent, the Davidson Current (Pirie et al. 1975). Each of these processes carries water having discrete qualities and identifiable characteristics. Nearshore water movements associated with each process are also substantially affected by tides, wind, internal waves, irregularities of the ocean bottom, and coastal features such as capes, bays, and rivers.

Recent studies by Pequegnat and Hodgson (1976) support the general contentions, except that currents were found to be much more variable during the Davidson (winter) season. The following excerpts from their reports summarize their findings:

> November 1975
>
> "Oceanographic currents prevailing during this study period appear to be consistent with the historical data presented by Pirie, Murphy, and Edmisten (1975). The nearshore transport was southerly with an average speed of one knot."

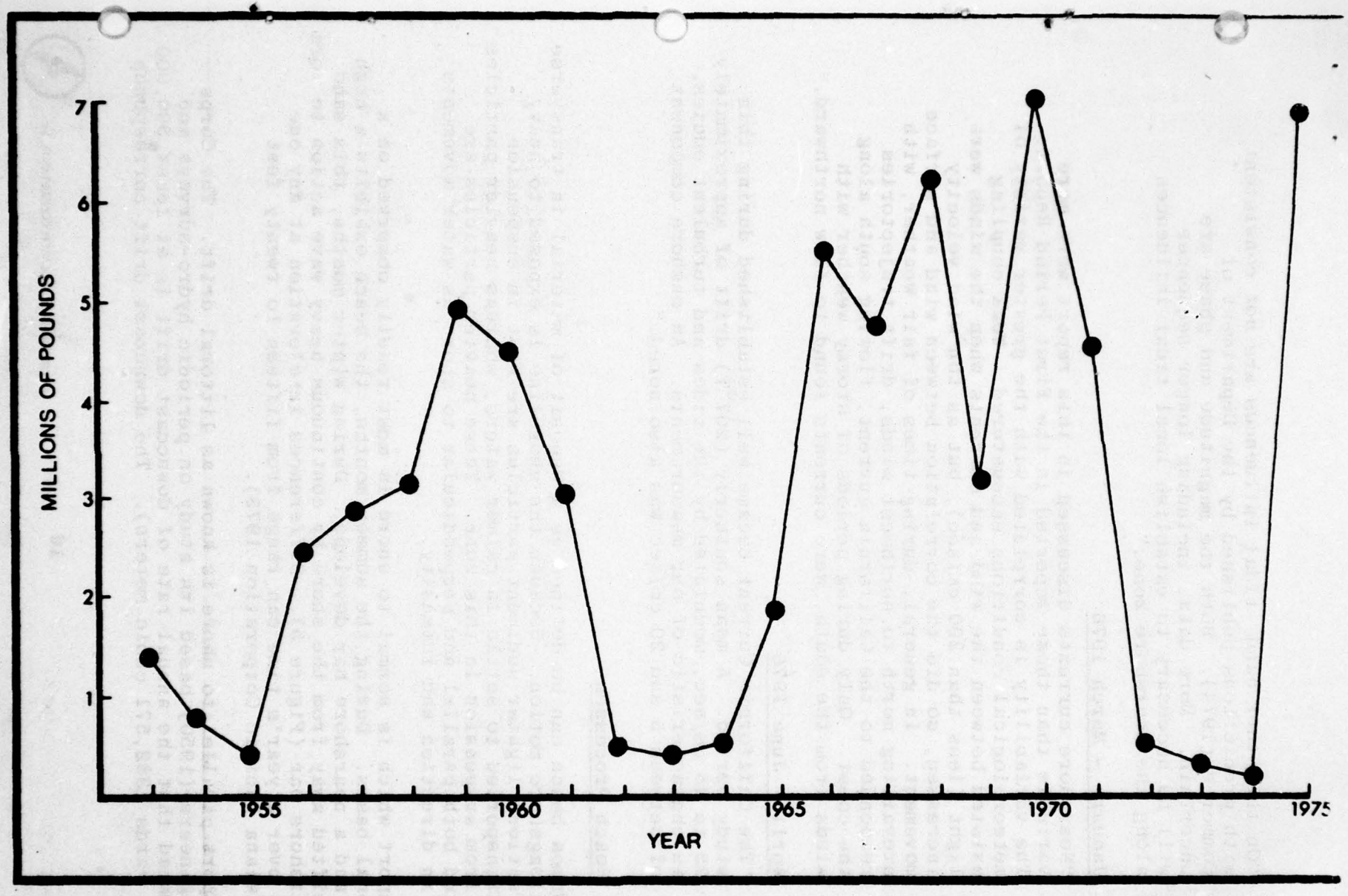

Figure 4. Commercial crab catch in millions of pounds landed at Eureka, including Fields Landing, California from 1953 to 1975

"On the other hand, tidal influences are not consistent with predictions published by the Department of Commerce (1974). Both the magnitude and phase are uncertain. More data, including longer sequences will be necessary to establish local tidal influences along the nearshore zone."

January - March 1976

"Nearshore currents discussed in this report were more variable than those reported in the First Period Report. The variability is correlated with the greater variety of meteorological conditions encountered. Weak coupling existed between the wind and currents when the winds were light (less than 200 cm/sec), but as the wind velocity increased, so did the correlation between wind and surface movement. In general, during times of fair weather, with prevailing north to northwest winds, drift trajectories responded to the California current, flowing south along the coast. Only during periods of stormy weather with winds from the south, were currents found to flow northward."

April - June 1976

"The California Current became well established during this study period. A mean southerly (207°T) drift of approximately 25 to 45 cm/sec, modulated by the tides and turbulent eddies, is characteristic of our measurements. An onshore component of between 5 and 20 cm/sec was also noted."

2. Beach Processes

The Samoa beach can be defined as a deposit of material in transverse and alongshore motion. Because the shoreline is exposed to heavy wave action, lighter sediment particles are kept in suspension and transported to settle in calmer waters, whereas heavier particles fall from suspension in this zone. These heavier particles are shifted both parallel and perpendicular to shore as water movements vary in direction and intensity.

Transport which is normal to shore is most readily observed on a seasonal basis. During the summer months, the beach exhibits a high berm and a nearshore bar develops. During winter months, this sand is shifted away from the shore by continuous heavy wave action to form an offshore bar (Figure 5). Differences in elevation at any one point over a year's time can range from fifteen to twenty feet (Louisiana Pacific Corporation 1973).

Transport parallel to shore is known as littoral drift. The Corps of Engineers (1950) based its study on periodic hydro-surveys and estimated that the annual rate of downcoast drift is at least 500,000 cubic yards (382,571 cubic meters). The downcoast drift corresponds

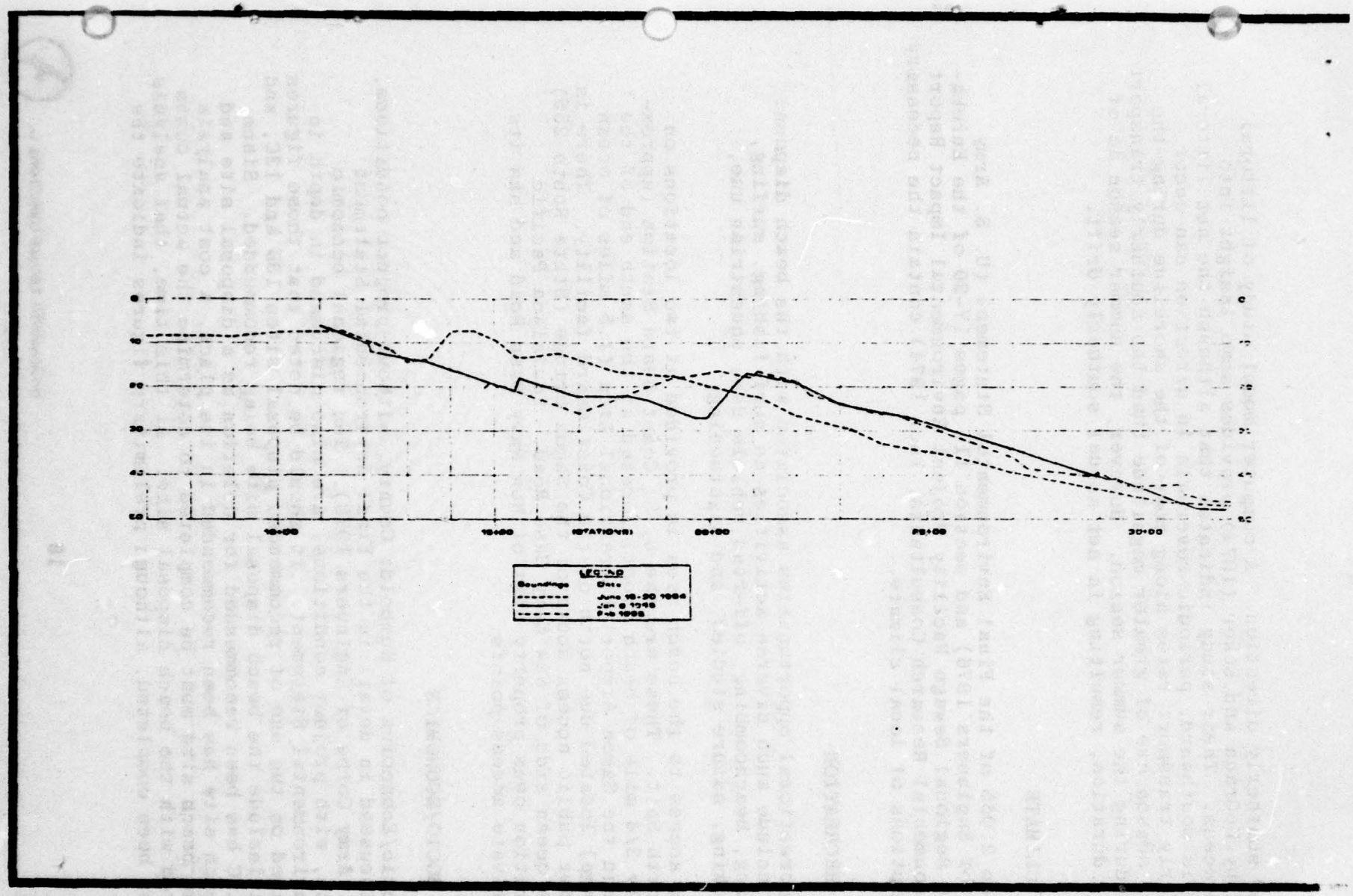

Figure 5. Bottom profile at centerline of Louisiana Pacific outfall (Winzler and Kelly 1976)

to the southerly direction. A computer model study of littoral drift by DeGraca and Ecker (1974) provides some insight into the process. Their study indicates that although the net littoral drift is southward, periodic reversals in direction can occur. Northerly transport rates along most of the shoreline during the winter season are of greater magnitude than the southerly transport rates during the summer season. However, the summer season is of longer duration, resulting in net annual southerly drift.

G. CLIMATE

Section 2.055 of the Final Environmental Statement (U. S. Army Corps of Engineers 1976) and section II, pages 17-20 of the Eureka-Arcata Regional Sewage Facility Project Environmental Impact Report (Environmental Research Consultants, Inc. 1974) contain the necessary descriptions of local climate.

H. RECREATION

The recreational opportunities associated with the beach disposal site include such diverse activities as surf fishing, surfing, swimming, beachcombing, off-road vehicle use, equestrian use, picnicking, nature studies, and sightseeing.

Public access to the beach area is provided at two locations on the North Spit. These are the U. S. Coast Guard Station (approximately 3/4 mile of beach front) located at the south end of the spit and the Samoa Airport Recreational Area (1.5 miles of ocean frontage) located due north of the Coast Guard facility. There is no other public access south of the Samoa Bridge (State Route 255) on the ocean side of New Navy Base Road. Louisiana Pacific Corporation owns property west of New Navy Base Road and has its own private access points.

I. SOCIO/ECONOMICS

The Socio/Economics of Humboldt County, without project conditions, are discussed in detail in the Final Environmental Statement (U. S. Army Corps of Engineers 1976). The regional economic impacts, with project conditions, are also discussed in depth in the Environmental Statement. It should be noted that those figures are based on the use of recommended disposal sites 13B and 13C, and do not include the beach disposal site being recommended. Since site 13C has been recommended for deletion as a disposal site and the beach site has been recommended in its place, a cost analysis for the beach site must be completed to determine the actual costs involved with the beach disposal site. At this time, that analysis has not been completed, although preliminary figures indicate the

cost ratios to be comparable. In any event, it is not expected that disposal at the beach site will cost more than at the originally proposed disposal site 13C.

J. ARCHAEOLOGICAL/HISTORICAL RESOURCES

1. Archaeological

The North Spit is a portion of the archaeologically rich Humboldt Bay area. This archaeological richness is due to the use of the Bay area by the Wiyot and pre-Wiyot Indian cultures for fishing and shellfish gathering.

An archaeological survey was undertaken by the Corps of Engineers at five recommended spoils disposal sites. That survey did not include the beach disposal site. To determine the archaeological significance of the beach disposal site and intermediate areas where the pipeline is to be placed, the Northwest Indian Cemetery Protective Association was contacted and they subsequently performed a systematic archaeological reconnaissance of the site and found no archaeological evidence (Appendix 6).

2. Historical

No historical sites are associated with this project.

III. IMPACTS

A. SEDIMENTATION IMPACTS

Because massive quantities of coarse-grained sand are shifted both parallel and normal to shore by natural forces, dispersal of the additional sediment load is not expected to be a problem. Silts will be deposited in offshore areas, whereas sand and gravel will remain nearshore for longer periods of time.

Both the North Coast Regional Water Quality Control Board (NCRWQCB) and the Environmental Protection Agency (EPA) require that the dredge spoils be compatible with beach sand. The EPA has specified that 91 percent of the dredge material must be retained on a #200 sieve (<9% silt). The NCRWQCB, however, has indicated that 2-3 percent silt may be unacceptable, although no specific guidelines other than those for receiving water characteristics have been approved. The NCRWQCB has also indicated that excess gravel in the spoils will be unacceptable. They have recommended that, if some of the spoils are determined as incompatible with beach sands, then a bypass system should be installed to dispose of these sediments.

B. IMPACTS ON WATER QUALITY

None of the U. S. Army Corps of Engineers samples (1974) exceeded EPA specifications for chemical content. Also, the chemical content of the dredge spoils does not differ substantially from that of the nearshore sediments (Appendix 5), and should not substantially alter receiving water quality. Turbidity is the only water quality parameter that may be significantly altered by dredge spoils disposal. The amount of increase in turbidity will depend on the amount of silt in the spoils, and on the severity of wave action in the nearshore zone.

C. IMPACTS ON GROUNDWATER

Use of the beach site for dredge spoils disposal will reduce the chance of contaminating the North Spit groundwater supply.

D. IMPACTS ON BIOLOGICAL RESOURCES

1. Terrestrial Impacts

The construction of the pipeline will involve the movement of heavy vehicles over the existing roadway and across a very restricted strip of coastal foredune environment. The vehicular movement will probably disrupt some dune vegetation. As vegetation in this area

is sparse it will be possible to choose a pathway that will keep this damage to a minimum. Beach plants generally spread by vegetative means such as stolons, rhizomes, and layering. The construction impacts for the pipeline will therefore be localized, of short duration, and largely unavoidable. Care in track selection is the only mitigation possible or necessary.

The construction of the pipeline is not expected to produce any significant impacts on the small animal and bird populations of the area.

The presence of the pipeline will provide a fine line of shade and shelter which will undoubtedly provide a habitat for insects, rodents, and the small predators which prey upon them.

2. Intertidal Impacts

The construction and presence of the pipeline in the intertidal will have a minimal effect on intertidal invertebrate populations most of which will be protected by their subterranean habitat. Any effects will be localized and ephemeral. No mitigation measures are contemplated.

The deposition of the dredge sediments may have a strong but highly localized impact on the intertidal invertebrates. If sediment deposition is rapid, the intertidal invertebrates may be buried beyond their ability to survive. However, most of these organisms are capable of withstanding burial for extended periods of time. It is by no means certain that mass mortalities will occur. In any event the operation will be so localized that recruitment will be almost immediate upon cessation of the operation.

Shore birds will be virtually unaffected by the dredge spoils deposition. It is possible that organisms in the dredge spoils will form a new food source for shoreline feeders.

No long term impacts are foreseen. No effects on long term productivity are anticipated. Timing of the dredging operation for maximum spoils dispersion is planned for economy and impact mitigation. Representatives of the California Department of Fish and Game and of the U. S. Fish and Wildlife Service have indicated no objections to open beach disposal (Appendix 1).

3. Subtidal Impacts

The disposal of dredge spoils on the beach will result in the movement of these sediments into the subtidal. The movement of sediments in this environment is a natural process (Louisiana Pacific Corporation 1973). The potential for impact exists in relation to the disparity between the grain size of the introduced sediments and the grain size of the extant subtidal sediments, the

presence of any toxic or otherwise detrimental materials in the introduced sediments, and the relative quantity of the introduced sediments.

Wave action will move and sort the sediment fractions. The coarse fractions which will stay in the study area the longest will have little or no impact on the subtidal infauna. The finer fractions, including silt and organic material will be kept in motion and thus in suspension until they reach quiet water. Quiet water in this instance will be deep water (one hundred feet or deeper) below the effect of wave motion, or inside Humboldt Bay. As water motion is responsible for the present sorting of sediments it can be assumed that the deposited sediments will eventually be deposited in areas of like sediment in a normal fashion. Thus any impact will be due to the passing of the silt and organic fractions through areas presently dominated by heavier sediments.

Because of the natural sorting action and the relatively small volumes involved, no significant impacts on subtidal environments are expected.

4. Impacts on Fish and Fisheries

Some fish may leave the immediate vicinity under conditions of high turbidity. However, fish that normally occupy the surf zone are well adapted to severe water movement and the associated suspended sediments. Because of this adaptation and the mobility of fish in the area, no adverse impact on fish populations is expected.

Some Dungeness crab may be smothered by the dredge spoils if sediment flow rates are very high. The Department of Fish and Game has indicated that this will not pose a significant impact (Appendix 1) on the crab population. The likelihood that this impact will occur is considered low.

E. IMPACTS ON RECREATION

The placement of a 24" pipeline across the beach on the North Spit has potential impacts on the recreational activities outlined previously. Since there are only two public access points on the ocean side of New Navy Base Road south of the Samoa Bridge (State Route 255) many people utilize off-road vehicles to gain access to the portions of beach they desire to use. If the pipe is placed on the beach, it can act as a barrier to people desiring to use those beach areas north of the pipe location. Since the pipe will run from the surf zone, eastward across private property to its point of origin, it is not feasible to drive around the pipe to gain access to points north of the pipe. However, this restriction is temporary in nature (approximately 20 months) and can be mitigated

by burying or bridging the pipe where it crosses the beach area.

Pedestrian and/or equestrian access to the northern area of the beach would not be seriously affected because of the relatively small diameter (24") of the pipe. These beach users would only be inconvenienced by having to step over the pipe to gain access to points north of the pipe. Again, if the pipe were to be buried this inconvenience would be significantly reduced.

Another aspect of the pipe placement across the beach and the adjacent private property would be that of the visual impacts on beach users. The pipe would be visible on the beach and the dune area immediately adjacent to the beach. The mitigating feature associated with this is the temporary nature of the project (20 months). Burying the pipe from the first row of foredunes, across the beach to its ocean outfall could mitigate the potential visual impacts of the pipe on the beach users.

Noise during the placement and removal of the pipeline could have adverse impacts upon recreational users. Some heavy equipment will be necessary during these two phases of the project for hauling the pipe to location as well as for assembly of the pipe. The noise can make it unpleasant for those users who would desire to hear only the sounds of the ocean. Only twice during the project will heavy equipment noise be apparent. The pipe itself makes no audible noise with the exception of the outflow area. At this point an audible sloshing sound can be heard which varies, dependent upon tide fluctuations.

Noise impacts can be mitigated by restricting the days of operation during the placement and removal of the pipeline to Monday through Friday, as beach use is heaviest on the weekends.

One other impact which must be considered is that of increased turbidity associated with the outflow. This increase will be a variable occurrence based on tidal fluctuation, ocean currents, hours and days of operation and the time involved in the assimilating and settling out of the dredge spoil material. During dredging and pumping operations, increased turbidity will be present. This condition can temporarily eliminate the recreational use of the ocean water area by swimmers, surf-fishermen (fish are able to avoid turbid waters) and surfers. The appearance of turbid waters may also affect use of the beach area for other recreational uses (i.e., beachcombing, picnicking, nature studies, sightseeing) because of the visual aspects of the turbid water.

Generally, the impacts (beach access, noise, visual qualities, water turbidity) on the beach area will be temporary in nature and can be mitigated, in most cases, as indicated above. Once the project is complete, the impacts will disappear.

F. SOCIO/ECONOMIC IMPACTS

The economic impacts of the Navigation Improvement of Humboldt Bay and Harbor are outlined in the Final Environmental Statement (U. S. Army Corps of Engineers 1976). With the proposed elimination of land disposal site 13C and the addition of the beach disposal site considered in this report, preliminary figures indicate that the changeover will be one of comparable costs and as such have no additional socio/economic impacts.

In the Final Environmental Statement it was stated on page 73, paragraph 6.023, that, "the contingency disposal site on the beach (17) has been dropped from consideration because of the possibility of clogging the industrial outfall located north and south of the site." Since that time, spokesmen from the two industries involved, Louisiana Pacific Corporation and Crown Simpson Pulp Company have indicated that in their estimation blockage of their industrial outfalls would not occur and no impacts would be sustained. They expressed no objections to the proposed disposal site.

G. ARCHAEOLOGICAL/HISTORICAL IMPACTS

To determine the archaeological significance of the beach spoils disposal site and the intermediate area for pipe placement, the Northwest Indian Cemetery Protective Association (NICPA) was contacted. NICPA performed a systematic archaeological reconnaissance of the area and found that no adverse impacts to cultural resources are anticipated by the project. NICPA further stated that if any artifactual remains were encountered operations should cease and NICPA should be contacted immediately.

Since there are no historical sites associated with this project, no impacts are anticipated.

IV. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THIS ALTERNATIVE IS CHOSEN

A. Turbidity in the immediate vicinity of the outfall will increase.

B. Disposing of dredged material into the intertidal will cause some mortality of intertidal invertebrates. Some subtidal benthic organisms may also be killed by the onslaught of new sediments introduced, although the degree will depend on wave conditions at the time of dumping.

C. Vegetation in the vicinity of the pipeline will be disrupted during construction and removal of the pipeline. Some *Erysimum menziesii* may be destroyed during pipeline construction and removal.

V. RELATIONSHIP BETWEEN LOCAL SHORT TERM USES OF MAN'S ENVIRONMENT AND LONG TERM PRODUCTIVITY

If this alternative is chosen, no change in relationships between short term uses of man's environment and long term productivity as described in the Final Environmental Statement (section 7.000) will occur (U. S. Army Corps of Engineers 1976).

VI. IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD OCCUR IF THIS ALTERNATIVE IS CHOSEN

No irreversible environmental changes are foreseen if this alternative is chosen for dredge spoils disposal.

VII. PERSONS CONTACTED

1. Jack Alderson, Executive Officer, Humboldt Bay Harbor Recreation and Conservation District, Eureka, California

2. James Benson, Northwest Indian Cemetery Protective Association, McKinleyville, California

3. Louise Bishop, Louisiana Pacific Corporation, Samoa Division

4. Les Fong, Environmental Branch, Army Corps of Engineers, San Francisco, California

5. Howard Hall, Crown Simpson Pulp Company, Samoa, California

6. John Hannum, Engineer, North Coast Region Water Quality Control Board, Santa Rosa, California

7. Tom Hannah, Humboldt County Historical Society - Oregon Archaeological Society, Eureka, California

8. Rich Harville, Humboldt County Historical Society, Eureka California

9. Les Irvine, Louisiana Pacific Corporation, Samoa Division

10. Ed Kandler, Archaeologist, Army Corps of Engineers, San Francisco, California

11. R. G. Rayburn, California Coastal Zone Conservation Commission, North Coast Region, Eureka, California

12. Robert Reynolds, Environmental Branch, Army Corps of Engineers, San Francisco, California

13. Bill Russ, Bureau of Land Management, Ukiah, California

14. Chris Vais, Permit Branch, Environmental Protection Agency, San Francisco, California

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APPENDICES

APPENDIX 1

AD HOC COMMITTEE MEETING
HUMBOLDT BAY NAVIGATIONAL IMPROVEMENT PROJECT
SPOILS DISPOSAL SITE

OCTOBER 19, 1976

Present:		
	Chuck Selden	John Smith
	Rick Rayburn	Jack Alderson
	Kaye Strickland	Guy Conversano
	Pat McLaughlin	Pat Reid
	Gary Brookman	Richard Dornhelm
	Lucille Vinyard	James Gast

The meeting was called to order by Commissioner Gast and a report made by him of the field trip to the spoils disposal sites on the North Spit in the area of the airport/dragstrip. It was reported that site 13 B has a large sandy arroyo and should hold about 1.8 million cubic yards of material, and it had been agreed on the field trip that this was the most impacted area by man. Site 13 C did have quite a natural dune habitat, the least impacted by man and the fewest exotic plants. The new beach disposal site, identified by Ralph Brown of the Corps of Engineers environmental branch, was described as an area that could take up to a half a million cubic yards possibly precluding the need to spoil site 13 C.

It was reported that the Corps of Engineers desired the Committee to think of spoiling a million cubic yards on the beach if it was decided to go there.

In making change recommendations to the Corps, the time frame was explained that the draft EIS was now a final and that it had been sent to the Office of the Chief Engineer (OCE) and that from there it would go to Presidents Council on Environmental Quality (CEQ) after which it would be published in the Federal Register with the public having 30 days to respond.

Discussion was then held on all of the sites and apparant possibilities during which Commissioner Gast reported that at any one given point on the beach 1/2 million yards of sand passes in a southerly direction, or a net loss, while 2 million cubic yards flow back and forth in front of that one spot. Additionally, the Mad River has a suspended load of 2.8 million cubic yards and a bed load of 166,000 cubic yards; the Eel River has a suspended load of 27 million cubic yards and a bed load of 1.2 million cubic yards.

It was a general consensus of the Committee that site 13 B should be utilized avoiding the populations of Erysimum Menziesii at its western fringe and north western corner. That material could be placed over the rest of the area from the natural barrier on the west edge to the old Navy base road. Where feasible, as much of the vegative areas as possible should be avoided and preserved plus the retention of top soil to help reseed the area.

Site 13 C should be avoided and rejected as a possible disposal site due to its environmental condition, it is fairly natural with minor

man and exotic intrusion plus a large population of Erysimum Menziesii. It was suggested that a beach disposal site be considered in the area of the Louisiana-Pacific porperty, namely on the Pacific Ocean side of the peninsula opposite the Samoa Cookhouse, and that this site be planned to take up to 1 million cubic yards. Also suggested was a re-look at site 13 A as an additional contingency area and a desire to know why the Coprs no longer considered it.

Other questions raised by the Committee:

1. Can beach disposal be regulated to avoid periods where there would be significant vegative environmental impact?

2. What is the planned dredging schedule within the bay? Can some areas be regulated to certain time frames?

3. Will there be one or two pipelines? If two, can they be used alternately or simultaneously?

4. For the beach disposal site, to what extent additional information be gathered to enable the deposition of spoils?

5. What would the difference in costs (dollars and energy) be to use the beach site for all deposition and is it possible?

A correction to the summary of the last meeting was requested by Rick Rayburn that on the ninth line; strike disposal area and insert North Spit.

The Committee felt they would like to remain in contact on this project and kept informed. They would like to know whenever the subject will be on the Commission's regular agenda.

APPENDIX 1

AD HOC COMMITTEE MEETING
HUMBOLDT BAY NAVIGATIONAL IMPROVEMENT PROJECT
SPOILS DISPOSAL SITE

NOVEMBER 17, 1976

Present:		
	Pat Mclaughlin	Pat Reid
	Gary Brookman	John Sawyer
	Vic Guynup	Lucille Vinyard
	Les Westfall	Kaye Strickland
	Lloyd Hecathorn	John Goolsby
	Les Irvine	Anita Goolsby
	Guy Conversano	Jerry Scott
	Richard Dornhelm	Jim Gast
		Bob Davenport

The meeting began at 7:00 p.m. with Commissioner Gast summarizing the recommendations of the ad hoc committee which were submitted to the District concerning the disposal sites. Basically, the committee recommended the abandonment of site 13C, the utilization of a major portion of site 13B, utilization of an ocean beach disposal site, and investigation of 13A as a possible contingency site. Beach disposal was recommended during the winter period when silt material in the water is high and the current travels primarily to the north.

Commissioner Gast brought the committee up to date on the project since the last meeting. Federal funds will not be released unless two disposal sites are designated and permits obtained. Mr. Rick Rayburn of the CZC staff, the Regional Water Quality Control Board, Ron Warner and Gary Monroe of the Dept. of Fish and Game, and Felix Smith and Rick Morat of the U.S. Fish and Wildlife Service have indicated no objections to the utilization of site 13B and ocean beach disposal. Written statements to this effect are forthcoming. If the committee approves of the utilization of the two sites, the District will prepare environmental material to amend the EIS accordingly and submit the appropriate application to the Coastal Zone Commission for its 9 December meeting.

Discussion was held on the beach disposal site. It was determined that this site was desirable as a significant disposal site rather than an overflow site. It was indicated that the Corps have not responded to the questions raised by the committee concerning beach disposal. It was pointed out that beach disposal was not considered feasible for the major disposal site due to the extended time and engineering costs and undesirable summer disposal. Approximately .5 to one million cubic yds of spoil material is proposed to be deposited at the beach site, leaving 1.2-1.7 million cubic yards to be deposited at 13B. Commissioner Davenport indicated that a similar beach disposal site was utilized at Crescent City with no adverse environmental effects.

Recognizing the abovementioned agency approval and the negligible environmental impact to the area the committee voiced no objection to the beach disposal site. There was a consensus that the District should proceed with the preparation of material necessary to satisfy Coastal Zone application requirements for the beach disposal site (designated 17 North) and site 13B.

Members of the committee will meet 19 November, 3:00 p.m., at site 13 A, to view the northeast corner proposed for contingency spoil disposal and determine an environmental assessment of said area.

The meeting was adjourned at 7:50 p.m.

APPENDIX 2

COMPOSITE SPECIES LIST OF INVERTEBRATES COLLECTED FROM SAMOA BEACH IN 1958-1961 AND 1975 AFTER ALLEN (1964) AND ERC (1976a)

Polychaetes

Glycinde (armigera)
Nephtys californiensis
Euzonus (Thoracophelia) mucronata
Unidentified cirratulid
Unidentified species

Isopods

Excirolana linguifrons
Alloniscus perconvexus

Amphipods

Atylus tridens
Eohaustorius washingtonianus
Mandibulophoxus gilesi (uncirostratus)
Monoculodes spinipes
Orchestoidea californiana
Orchestoidea (corniculata)
Paraphoxus milleri
Dogielinotus sp.
Unidentified species (2)
Hyperid amphipod

Decapods

Emerita analoga
Crangon sp.

Bivalves

Siliqua patula

Nemertean

Tubulanus pellucidus

Gastropods

Olivella biplicata

Mysids

Archaeomysis maculata

APPENDIX 3

Biomass and percentage composition by weight of major groups of animals of benthos at three stations, Samoa transect, 1959--1961

(Allen 1964)

Station number	S-2			S-4			S-7		
Depth in fathoms	7			17			36		
Year	1959	1960	1961	1959	1960	1961	1959	1960	1961
Number of Grabs	7	4	5	3	4	5	1	4	5
Total volume of sediment sampled in liters	84.5	45.4	56.0	24.3	39.4	40.0	49.6	73.2	201.0
Biomass									
1. Grams per liter	0.96	0.33	0.90	0.42	0.05	0.67	0.50	0.86	0.66
2. Grams per square meter	57.9	18.0	50.6	16.8	2.4	26.9	125.0	78.7	132.3
Percentage Composition by weight in grams by major groups									
Mollusca	70.6	4.6	63.6	22.8	11.2	8.9	0.3	74.0	65.4
Polychaeta	9.3	59.0	19.7	42.7	50.0	49.8	34.0	21.0	25.9
Coelenterata	0.8	--	--	1.9	--	--	4.4	1.3	0.8
Crustacea	4.9	2.0	4.2	17.7	33.3	21.9	4.0	1.0	0.4
Echinoderms	13.6	29.1	11.9	1.0	2.2	14.9	47.3	2.7	1.1
Nemertea	0.8	5.3	--	13.9	2.3	4.1	--	--	1.5
Unidentified & miscellaneous	--	--	0.8	--	--	0.4	--	--	4.9

APPENDIX 3

GEORGIA-PACIFIC - CROWN SIMPSON SURVEY

SPECIES LIST

(DeMartini et al. 1970)

Nemerteans
Cerebratulus
misc. Polychaetes
Glycinde
Haploscoloplos
Maldanid
Nephtys
Nothria
Sthenelais
Tharyx
Spionids
Glycerids
Cirratulid
Gammarid #1
Gammarid #2
Gammarid with hook
misc. Gammarids
Ampelisca
Diastylopsis
Cumacean
Isopods
Archaeomysis
Crago
Crab
Cancer
Crab zoea
Haustoriids
Olivella
Nassarius
Tellina
Siliqua
misc. bivalves
Amphipholis
Dendraster
Magelonids

APPENDIX 3

SPECIES LIST AND PRESENCE/ABSENCE OF SPECIES COLLECTED AT BENTHIC STATIONS IN NOVEMBER 1975 AND JUNE 1976

(E.R.C., Inc. 1976a)

	November 1975	June 1976
CRUSTACEANS		
Amphipods		
Ampelisca macrocephala	x	
Aorides columbiae	x	
Atylus tridens	x	x
Eohaustorius sencillus	x	x
Eohaustorius sp.		x
Eohaustorius washingtonianus	x	
Hippomedon denticulatus	x	
Hyperid amphipod	x	x
Ischyrocerus pelagops	x	x
Jassa falcata		x
Mandibulophoxus gilesi	x	x
Monoculodes spinipes	x	x
Paraphoxus epistomus	x	x
Paraphoxus obtusidens	x	x
Paraphoxus spinosus	x	x
Paraphoxus sp. *(milleri)*	x	
Paraphoxus tridentatus		x
Paraphoxus vigitegus	x	x
Photis brevipes	x	
Photis conchicola	x	x
Photis females & juveniles	x	x
Protomedeia zotea	x	
Synchelidium rectipalmum	x	
Synchelidium shoemakeri	x	x
Unidentified Gammarid sp. C	x	
Unidentified Gammarid sp. D	x	
Isopods		
Bathycopea daltonae	x	
Edotea sublittoralis	x	x
Excirolana linguifrons	x	
Munna sp.	x	
Synidotea bicuspida	x	x
Tecticepe convexus	x	x
Cumaceans		
Diastylopsis dawsoni	x	x
Hemilamprops sp.	x	x
Mysids		
Archaeomysis maculata	x	x

	November 1975	June 1976
Decapods		
Cancer magister	x	x
Cancer sp.	x	
Caridean larva		x
Crangon stylirostris	x	
Decapod zoea		x
Pagurus sp.	x	
Copepods		
Unidentified Copepod spp.		x
ECHINODERMS		
Amphiodia sp.		x
Amphiodia urtica		x
Amphiurid juveniles	x	x
Caudina sp.	x	x
Dendraster excentricus	x	x
NEMERTEANS		
Amphiporus sp.	x	x
Carinoma mutabilis	x	x
Cerebratulus californiensis	x	x
Tetrastemma sp.	x	
Tubulanus pellucidus	x	x
PHORONIDS		
Phoronis sp.		x
MOLLUSCS		
Gastropods		
Aglaja diomedea		x
Mitrella gouldi	x	
Nassarius fossatus	x	x
Odostomia sp.	x	
Olivella pycna	x	x
Bivalves		
Adula diegensis		x
Axinopsida sp.	x	x
Macoma sp.	x	x
Siliqua patula	x	x
Tellina bodegensis	x	
Tellina modesta	x	x
Tellinid juveniles	x	x

	November 1975	June 1976
POLYCHAETES		
Ampaeana occidentalis	x	x
Amphicteis gunneri	x	
Anaitides groenlandica	x	
Anaitides sp.	x	
Anaitides williamsi	x	
Aricidea suecia	x	x
Capitella capitata	x	x
Capitellid, unidentified		x
Capitita ambiseta	x	x
Chaetozone setosa	x	x
Cheilonereis cyclurus	x	
Chrysopetalum occidentale		x
Cirratulid, unidentified	x	
Cirriformia sp.		x
Eteone alba	x	
Eteone californica	x	
Eteone dilatae	x	
Glycera convoluta	x	
Glycera oxycephala		x
Glycera sp.	x	
Glycinde polygnatha	x	x
Gyptis arenicola glabra		x
Haloscydna brevisetosa	x	
Haploscoloplos elongatus	x	x
Harmothoe sp.	x	x
Lumbrineris index		x
Lumbrineris limicola	x	
Lumbrineris sp.	x	x
Magelona pacifica		x
Magelona pitelkai	x	
Magelona sacculata	x	x
Nephtys caecoides	x	x
Nephtys californiensis	x	
Nephtys glabra	x	
Nephtys parva	x	x
Nereid, unidentified		x
Nerinides sp.	x	
Nerinides (tridentata)	x	
Nothria elegans	x	x
Notomastus lineatus	x	
Notomastus sp.	x	x
Owenia collaris	x	
Pholoe glabra	x	
Phyllodoce sp.	x	
Phylo felix	x	x

	November 1975	June 1976
Scalibregma inflatum	x	x
Scolelepis acuta	x	
Scoloplos acmeceps	x	x
Spiophanes anoculata	x	x
Spiophanes berkeleyorum	x	x
Spiophanes bombyx	x	x
Sthenelais juveniles	x	
Sthenelais verruculosa	x	x
Thalenessa spinosa	x	x
Tharyx sp.	x	x
Typosyllis hyalina	x	
Typosyllis sp.		x

APPENDIX 4

COMPOSITE SPECIES LIST OF FISHES
COLLECTED OFFSHORE FROM SAMOA, CALIF.
(ALLEN 1964, DeMARTINI et al. 1965-70, ERC 1976b)

Common Name	Scientific Name
American shad	*Alosa sapidissima*
Bat ray	*Myliobatis californica*
Bay pipefish	*Sygnathus leptorhyncus*
Big skate*	*Raja binoculata*
Black rockfish*	*Sebastes melanops*
Brown smoothhound	*Mustelus henlei*
Buffalo sculpin	*Enophrys bison*
Butter sole**	*Isopsetta isolepis*
Cabezon	*Scorpaenichthys marmoratus*
California skate	*Raja inornata*
Curlfin turbot	*Pleuronichthys decurrens*
Dover sole	*Microstomus pacificus*
English sole*	*Parophrys vetulus*
Eulachon	*Thaleichthys pacificus*
Kelp greenling	*Hexagrammos decagrammus*
Green sturgeon	*Acipenser medirostris*
King salmon	*Oncorhynchus tshawytscha*
Leopard shark	*Triakis semifasciata*
Lingcod	*Ophiodon elongatus*
Longfin (Sacramento smelt)	*Spirinchus thaleichthys*
Night smelt**	*Spirinchus starksi*
Northern anchovy	*Engraulis mordax*
Pacific hake	*Merluccius productus*
Pacific hagfish	*Eptatretus stoutii*
Pacific herring	*Clupea harengus*
Pacific sanddab*	*Citharichthys sordidus*
Pacific sandlance	*Ammodytes hexapterus*
Pacific tomcod**	*Microgadus proximus*
Padded sculpin	*Artedius fenestralis*
Penpoint gunnel	*Apodichthys flavidus*
Petrale sole	*Eopsetta jordani*
Pricklebreast poacher**	*Stellerina xyosterna*
Redtail surfperch	*Amphistichus rhodoterus*
Ringtail snailfish	*Liparis rutteri*
Rockfish, juveniles	*Sebastodes*
Sablefish	*Anoplopoma fimbria*
Saddleback gunnel	*Pholis ornata*
Sand sole*	*Psettichthys melanostictus*
Seaperch, unidentified	Embiotocidae
Shiner perch*	*Cymatogaster aggregata*
Showy snailfish*	*Liparis pulchellus*

APPENDIX 4 SPECIES LIST (continued)

Common Name	Scientific Name
Silver seaperch	*Hyperprosopon ellipticum*
Slipskin snailfish	*Liparis fucensis*
Smelt, unidentified	Osmeridae
Speckled sanddab*	*Citharichthys stigmaeus*
Spotfin surfperch	*Hyperprosopon anale*
Staghorn sculpin*	*Leptocottus armatus*
Starry flounder	*Platichthys stellatus*
Striped seaperch	*Embiotoca lateralis*
Surf smelt	*Hypomesus pretiosus*
Threespine stickleback	*Eopsetta jordani*
Tubenose poacher	*Pallasina barbata*
Walleye seaperch	*Hyperprosopon argenteum*
Warty poacher	*Occella verrucosa*
Whitebait smelt	*Allosmerus alongatus*
White croaker	*Genyonemus lineatus*
White perch	*Panerodon furcatus*

* Either common or abundant in most collections

** Common and abundant in most collections

APPENDIX 5

TRACE METALS IN SEDIMENTS

FEBRUARY 21, 1976

(concentrations in mg/kg dry weight)

(Winzler and Kelly, 1976)

PARAMETER	STATION															
	A		M		AB		AC		B		C		G		J	
	0-2 cm	2-5 cm	0-2 cm	2-5 cm	0-2 cm	2-5 cm	0-2 cm	2-5 cm	0-2 cm	2-5 cm	0-2 cm	2-5 cm	0-2 cm	2-5 cm	0-2 cm	2-5 cm
Aluminum	8,400	5,700	6,700	5,700	3,700	5,800	4,300	4,300	8,600	7,500	7,500	5,700	5,700	5,900	5,500	7,400
Arsenic	21	20	15	16	20	20	17	10	25	22	24	24	20	21	17	21
Cadmium	0.07	0.05	0.05	0.05	<0.05	<0.05	<0.05	0.06	0.05	<0.05	0.05	0.06	<0.05	<0.05	0.05	0.08
Chromium	110	85	110	100	85	120	120	120	120	110	130	120	120	97	140	120
Copper	9.2	7.6	7.4	8.1	6.8	7.4	7.1	7.5	9.2	8.2	7.4	6.4	7.2	7.8	8.8	9.4
Lead	5.8	5.0	6.5	6.2	4.7	5.5	5.6	6.0	6.5	5.7	6.5	6.3	5.8	5.6	5.2	6.7
Mercury	0.19	<0.10	0.23	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel	78	74	77	74	67	67	68	77	83	78	75	69	68	69	79	84
Silver	7.8	5.9	6.7	6.0	10.1	8.3	5.5	4.8	10.4	12.1	7.7	6.6	7.5	7.0	7.3	6.7
Zinc	52	46	48	52	48	50	46	48	55	52	48	47	46	47	54	59

APPENDIX 6

NORTHWEST INDIAN CEMETERY
PROTECTIVE ASSOCIATION INC.

PHONE 707 · 839-3231
~~3758 CESSNA AVE. AIRPORT~~
McKINLEYVILLE CALIF. 95521

P. O. Box 2668

Environmental Research Consultants, Inc.
P. O. Box 4120 Arcata, Calif. 95521

Atten: Mr. Alan Ardizone

As a requirement for the addendum to the Humboldt Bay Navigational Improvement Environmental Impact Station, a request from you to N.I.C.P.A. to investigate the possibility of creating adverse impacts to archeological and cultural resources was received Nov. 22, 1976.

The area in question is located on the North Spit between Humboldt Bay and the Pacific ocean and is being proposed as an alternate disposal for dredging fill. The area has been previously disturbed and after a thorough literature search for indications of cultural resources, N.I.C.P.A. finds that the proposed project, although involving minimal excavation, should present no adverse impacts to cultural resources.

However, we do require that, if in the event of development, archeological or cultural resources are encountered, that your project cease and N.I.C.P.A. be notified immediately.

Sincerely yours,

James R. Benson

by JAMES MOON, Jr.

FINAL ENVIRONMENTAL STATEMENT

NAVIGATION CHANNEL IMPROVEMENTS AUTHORIZED FOR HUMBOLDT HARBOR AND BAY, HUMBOLDT COUNTY, CALIFORNIA

Prepared By
U.S. Army Corps of Engineers, San Francisco District, California

August, 1976

NAVIGATION CHANNEL IMPROVEMENTS

HUMBOLDT HARBOR AND BAY
HUMBOLDT COUNTY, CALIFORNIA

SUMMARY

( ) DRAFT ENVIRONMENTAL STATEMENT (X) FINAL ENVIRONMENTAL STATEMENT

RESPONSIBLE OFFICE: U.S. Army Engineer District, San Francisco
211 Main Street
San Francisco, California 94105
(415) 556-6665

1. Name of Action: (X) Administrative ( ) Legislative

2. Description of Action: Navigation channel improvements include the following: Widening of three North Bay channel bends up to an additional 200 feet; deepening the North Bay, Samoa and Eureka Channels to 35 feet; widening the Samoa Channel from 300 to 400 feet; and constructing a 1,000 by 1,100 by 35-foot deep turning basin at the end of the Samoa Channel. The sediment will be dredged partially by a government owned hopper dredge and mainly by contracted construction with a hydraulic pipeline dredge. The material will be deposited at two sites on the North Spit. A small quantity will be disposed of in the ocean.

3. a. Environmental Impacts: Channel improvements will reduce tidal delays currently experienced by most vessels calling at the port, allow somewhat larger vessels to use the harbor and improve the safety and efficiency of shipping. Benthic life in the dredged areas will be destroyed but recolonization will occur. Temporary turbidity will result from the dredging and most of the flora and fauna at the disposal sites will be destroyed.

b. Adverse Environmental Effects: Turbidity levels within 100 meters of the dredge will be high but should subside to near background levels within 1/4 - 1 hour after cessation of dredging. Shallow groundwater supplies near the disposal site may become saline. About 16 wells could be affected; eight of these serve residences that still rely exclusively on them for domestic supply, though municipal supplies of better quality are readily available. Approximately two square miles of benthic habitat would be removed, but partial to full recovery within 2 - 6 months is expected. Habitat for a native dune plant species Erysimum menziesii will be reduced. Mitigation is being arranged.

4. Alternatives: No project; modification of scale of improvements; other disposal sites.

FINAL ENVIRONMENTAL STATEMENT

NAVIGATION CHANNEL IMPROVEMENTS AUTHORIZED
FOR
HUMBOLDT HARBOR AND BAY, HUMBOLDT COUNTY,
CALIFORNIA

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NAVIGATION CHANNEL IMPROVEMENTS AUTHORIZED
FOR
HUMBOLDT HARBOR AND BAY,
HUMBOLDT COUNTY, CALIFORNIA

1.000 PROJECT DESCRIPTION

A. Authorization: The plan of improvement described in House Document No. 330, 90th Congress, 2nd Session, was authorized for construction by the River and Harbor Act of 1968 (P.L. 90-483). Certain changes in recommended features of the plan and channel dimensions have resulted from economic review and detailed engineering and pre-construction planning investigations made in connection with the General Design memorandum and this Environmental Statement. The sponsoring agency is the Humboldt Bay Harbor, Recreation and Conservation District. The local sponsor has provided a resolution of intent to participate in bearing the non-federal share of the project costs and obligations. These obligations as specified in the Project Document are quoted in 1.003.

1.001 B. Purpose: This final Environmental Statement with replies to comments generated from wide circulation and review of the draft is submitted in accordance with the requirements of the National Environmental Policy Act (P.L. 91-190).

1.002 C. Project Description - Dimensions: The location and extent of existing deep draft navigational channels in Humboldt Bay that are maintained by the Corps of Engineers are shown on Plate 1. A study for a plan of navigation improvement to modify the existing project in the Harbor is based upon requests made by the local sponsors. The currently recommended plan of improvement departs in only minor respects from dimensions authorized by Congress in the Project Document. These changes are recommended on the basis of public hearings and pre-construction planning studies undertaken to evaluate current needs and goals. From these studies the District Engineer now recommends that the following work (see Plate 2) be accomplished: (a) widen the channel bends (up to an additional 200 feet), in the North Bay Channel at Mile 0.75, Mile 2.0, and Mile 2.60; (b) deepen the North Bay Channel from its present depth of 30 feet to 35 feet between Mile 0.75 and Mile 4.29; (c) deepen the Samoa Channel from 30 to 35 feet and widen from 300 to 400 feet between Mile 4.29 and Mile 5.84; (d) deepen the Eureka Channel from 30 feet to 35 feet between Mile 4.29 and Mile 5.0; (e) construct a turning basin 35 feet deep and 1,000 feet wide by 1,100 feet long at the end of the Samoa Channel. The Eureka Channel between Mile 5.00 and 6.30 which is presently at 26 feet will not be deepened, nor will the 40-foot deep Bar and Entrance channel. All channel widths are measured at the channel bottom. Side slopes are 2 horizontal to 1 vertical. All depths are below mean lower low water (MLLW).

1.003 D. Departures from Proposed Project Document Plan: The recommended widening of the Samoa Channel and provisions of a turning basin in lieu of the anchorage area described in the Project Document (H.D. No. 330), are the only significant dimensional changes in the scope of project improvement now recommended. Other departures include some additional provisions in sponsor obligations required to comply with Congressional legislation passed since 1968. The local sponsor for the project is the Humboldt Bay Harbor, Recreation and Conservation District. A summary of these non-Federal obligations are presented below:

a. Provide and maintain at local expense adequate wharf and terminal facilities in the North Bay, Eureka, and Samoa Channels open to all on equal and reasonable terms for the storage, handling, and shipment of lumber and general commerce;

b. Provide and maintain, without cost to the United States, depths in berthing areas and local access channels serving the terminals and wharves commensurate with the depths provided in the related project channels;

c. Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial disposal of spoil, and also necessary retaining dikes, bulkheads, and embankments therefor or the costs of such retaining works;

d. Hold and save the United States free from all claims for damages to wharves, piers, and other marine and submarine structures due to initial dredging work and subsequent maintenance dredging, except where such damages are due to the fault or negligence of the United States or its contractors;

e. Accomplish at local expense all alterations as may be required to sewer, water supply, drainage, cableways, and other utility facilities;

f. Comply with all pertinent provisions of Public Law 91-646 in the land acquisition program;

g. Prohibit construction of new terminals and related structures within 125 feet of the project lines along the North Bay and Samoa Channels;

h. Establish regulations concerning discharge of pollutants in waters of the harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State and local authorities responsible for pollution prevention and control;

i. Provide for revegetation of the upland disposal sites including stockpiling and restoration of a sufficient amount of topsoil to adequately reseed the area with native vegetation and provide special measures to insure propagation of any rare plants found on the sites in accordance with plans and specifications prepared by the Corps of Engineers; (see 4.062, 4.063 and 5.011) and,

j. Monitor ground water quality in active wells that may be affected by dredge material disposal and undertake measures necessary to provide adequate drinking water.

1.004 E. Dredging: Dredging seaward of project mile 1.0 of the North Bay Channel will be by a government-owned hopper dredge which can work in the rough waters of the entrance channel. The material removed from this section is expected to total 190,000 cubic yards. The remainder of the area will be dredged by a private contractor using a hydraulic suction dredge. An additional 2,210,000 cubic yards are expected to be removed in this manner. Hopper dredging is expected to begin in the spring of 1978 and to last two months. Project construction by contract is scheduled to begin in May, 1977 and to be completed in January, 1979. A description of the sediment to be dredged is presented in Chapter 2.

1.005 F. Disposal Areas: The hydraulically dredged material will be pumped through a floating pipeline and placed in two disposal sites (sites 13-B and 13-C, Plate 23) on the North Spit adjacent to the Eureka Airport. Retaining dikes will be constructed to contain the dredge material, and to prevent material from covering the New Navy Base Road, the dragstrip and the airport. A settling area and drainage trenches with baffles would be used to clarify effluent (see Plate 24). The two sites would have a total capacity of 2.61 million cubic yards on 110 acres owned by the city of Eureka.

1.006 Site 13-C is ideally located to receive large quantities of dredge material from the lower North Bay Channel. This 50 acre site, capable of holding more than 820,000 cubic yards, will require placement of the dredge pipe under the highway, but its positive features more than rule out this minor problem. Retention dikes of from 2 to 20 feet in height would be required. The area consists of rolling dunes with 10-20 feet between the troughs and crests. Environmental impacts, while negative, are not extensive enough to override the negative impacts or higher costs of disposal at sea, on the beach, or in areas that are more environmentally sensitive.

1.007 Site 13-B can contain about 1.8 million cubic yards on the sixty acres between the highway and dragstrip. It includes a large area of barren sand dunes which is used by recreational vehicles. Retention dikes of from 2 to 24 feet in height would be required but there would be only minor impacts on wildlife habitat. Except for these differences, the site is similar to 13-C, and presents a good location for material from the central North Bay Channel and the Samoa and Eureka Channels.

1.008 The combined capacity of the two disposal site is 2.61 million cubic yards. The amount of material estimated to be dredged is 2.21 million cubic yards, but it is impossible to predict either of the figures with extreme accuracy prior to actual operations.

1.009 Most of the water from the dredged material would percolate down into the sand and enter the water table. Excess water would be allowed to settle and would be drained over a series of settling basins and silt trapping baffles to the ocean or bay (see 2.044, 4.041 and 5.004 for details on groundwater).

1.010 Hopper dredge material would be disposed of in the ocean at an Environmental Protection Agency designated site (SF-3) located 1.5 nautical miles offshore. The site is 1,500 feet in diameter, centered at Latitude 40° 45' 44" North and Longitude 124° 15' 42". Depths at the site range from 65 to 78 feet (Plate 22).

1.011 The non-recommended alternative sites are discussed in more detail in Chapter 6.

1.012 G. Economics: The Federal share of the project cost is estimated to be $5,580,000 and the local share is estimated to be $1,080,000, for a total project cost of $6,660,000. The estimated annual benefits are $697,000 and the annual charges are $308,000. The cost-to-benefit ratio is 2.3:1 based on an interest rate of 3-1/4 percent amortized over a 50-year project life, in accordance with law for projects authorized in 1968. A further breakdown of costs and a summary of benefits are available from the Corps on request, and in the General Design Memorandum.

1.013 H. Re-vegetation: Before disposal operations begin, the local sponsor will be required to bulldoze and stockpile a portion of the existing vegetation and some of the upper layer of soil from all areas except the tops of the higher dunes. The stockpiled vegetation and soil, which contains native seed, will be spread over the area at the termination of the disposal to aid in re-vegetating the site. The tops of higher dunes will not be covered by the dredged material and will act as islands of vegetation for re-seeding the new material. The remainder of the disposal area will be re-seeded, using native species (see 4.056). Signs urging people to stay off of the newly seeded site will be posted around the disposal areas and maintained for 2 years.

2.000 ENVIRONMENTAL SETTING

A. General Description.

2.001 Humboldt Bay, a harbor on the coast of northern California, is about 225 nautical miles north of San Francisco and 156 nautical miles south of Coos Bay, Oregon (see Plate 1). A narrow sandspit varying in width from 1/8 to 1 mile separates the Bay from the ocean. An entrance channel about 2,000 feet wide divides the spit into north and south sections. The entrance is stabilized by two rubble-mound jetties which extend from the tips of the two spits (see Plate 24).

2.002 The City of Eureka and the Humboldt Bay area lie in the Northern Coast Ranges physiographic province of California. The topography of the Humboldt Bay area is relatively flat and is characterized by the Bay tidal flats rising to slightly elevated flat or rolling terraces. Humboldt Bay is bordered on the south by a narrow ridge called Table Bluff and is bordered on the east and north by mountains. The north-northeast trending sandspits which separate the Bay from the ocean have a well developed sand beach throughout their length and sand dunes extend inland for several thousand feet.

2.003 The Bay is quite shallow, and channels for fishing boats and shipping vessels are maintained by dredging. Jacoby and Freshwater Creeks discharge into the north end of the Bay, and Elk River and Salmon Creek discharge into the central portion and southern end of the Bay, respectively. These streams and their corresponding sloughs are tidal from one to two miles inland from their mouths. The flood plains along the tidal reaches are uniformly level marshland and mudflats. There are many smaller tidal sloughs at the north end of the Bay near Arcata. The Mad River Slough, a former mouth of the Mad River, extends inland for about three miles near Arcata. The present mouth of the Mad River is about five miles north of Humboldt Bay.

2.004 The width of the Bay varies from one-half miles to about four miles, and is 14 miles in length. The total surface areas of the Bay during high and low tide are about 25 and 8 square miles, respectively. The tidal range at the south jetty is 6.4 feet between mean lower low water (MLLW) and mean higher high water (MHHW). The average tidal discharge passing through the entrance is 100,000 cubic feet per second.

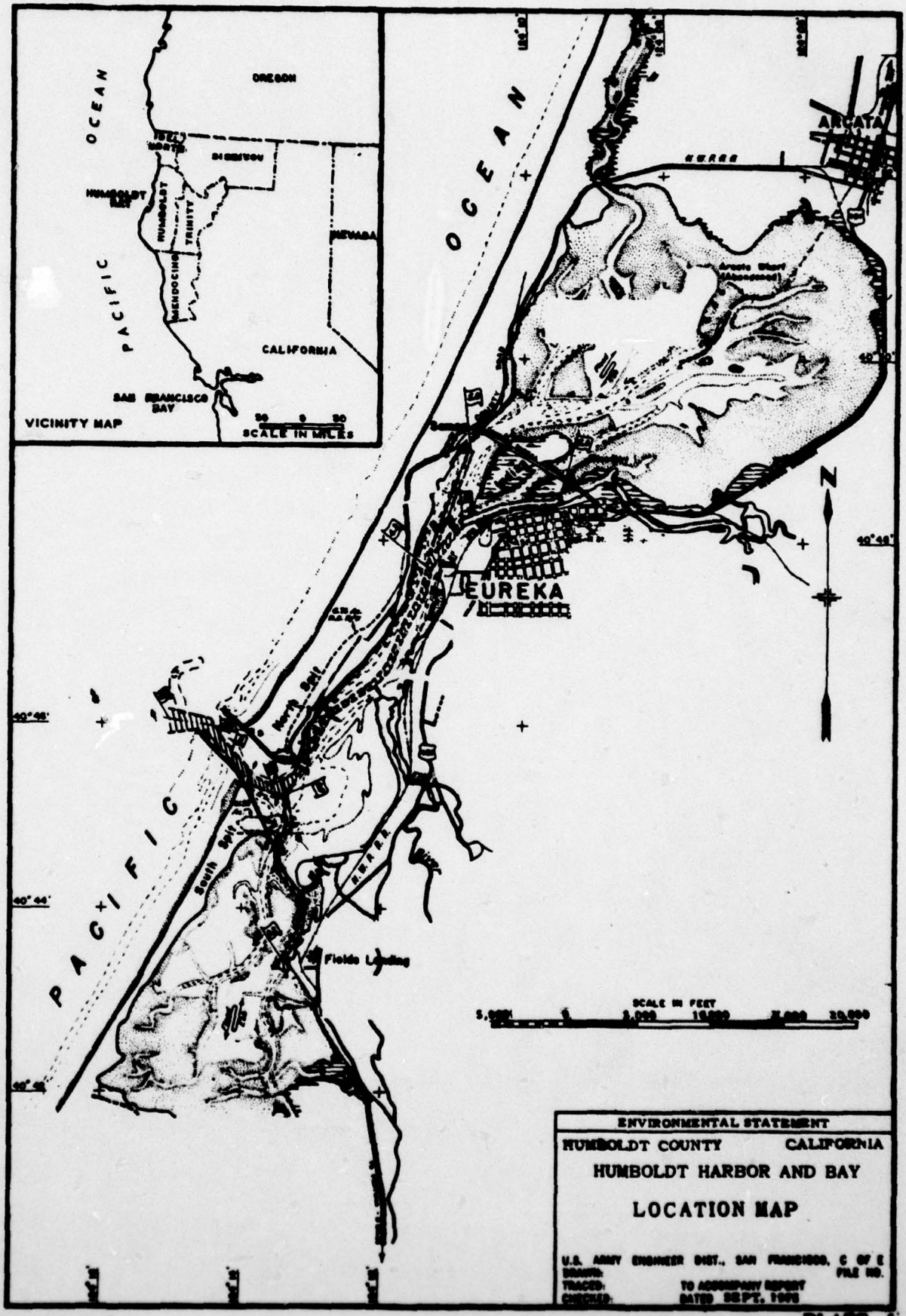
2.005 The southern arm of Humboldt Bay extends about four miles south from the entrance, widening gradually from one-half mile to two and one-quarter miles. A dredged channel extends two miles from the entrance to Fields Landing, which is about midway along the east side of the South Bay.

2.006 North of the entrance, a fairly deep natural channel closely follows the north spit for about four miles to the junction of Samoa Channel and Eureka Channel. The latter channel, following Eureka Slough, is dredged for almost 2 miles along the waterfront of the City of Eureka. The Samoa Channel is dredged across Indian Island Shoal for about one mile to Samoa on the north spit. A natural channel extends in a northeasterly direction from Samoa, through the shoal waters of Arcata Bay to a channel about one mile long originally dredged to serve the City of Arcata. Wharves and piers related to the Arcata Channel have been either removed or allowed to deteriorate. At present there is no commercial traffic on the Arcata Channel.

B. Historical Project Activity.

2.007 The Corps of Engineers' project for the improvement of Humboldt Bay was adopted by various River and Harbor Acts between 1881 and 1968. Construction of the south jetty was initiated in 1889 and of the north jetty in 1891. Under the existing project the original jetties have been entirely rebuilt and the harbor channels further improved. The existing jetties project authorized prior to the 1968 Act was completed in 1954. Additional channel improvements were authorized in 1968.

2.008 The following table presents a summary of maintenance dredging of the five channels in the harbor during the past 10 years. Numbers represent cubic yards removed. Dredging is usually limited to specific shoal areas, not the whole channel.



ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR AND BAY

LOCATION MAP

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN: FILE NO.
TRACED: TO ACCOMPANY REPORT
CHECKED: DATED SEPT. 1975

PLATE 1

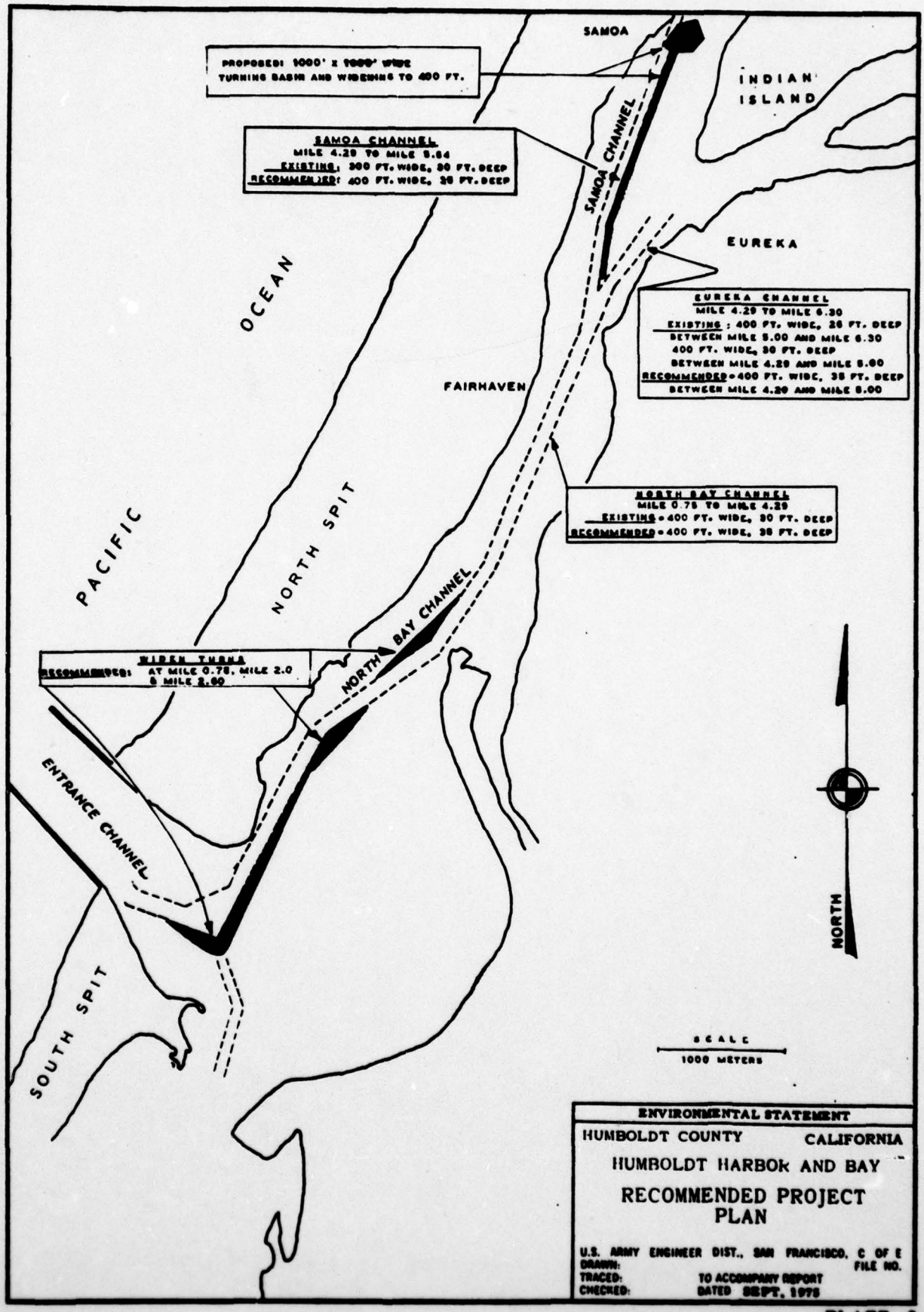

PROPOSED: 1000' x 1000' WIDE
TURNING BASIN AND WIDENING TO 400 FT.
SAMOA
INDIAN
ISLAND
SAMOA CHANNEL
SAMOA CHANNEL
MILE 4.29 TO MILE 5.64
EXISTING: 300 FT. WIDE, 30 FT. DEEP
RECOMMENDED: 400 FT. WIDE, 35 FT. DEEP
EUREKA
EUREKA CHANNEL
MILE 4.29 TO MILE 6.30
EXISTING: 400 FT. WIDE, 25 FT. DEEP
BETWEEN MILE 5.00 AND MILE 6.30
400 FT. WIDE, 30 FT. DEEP
BETWEEN MILE 4.29 AND MILE 5.00
RECOMMENDED: 400 FT. WIDE, 35 FT. DEEP
BETWEEN MILE 4.29 AND MILE 5.00
OCEAN
FAIRHAVEN
NORTH BAY CHANNEL
MILE 0.75 TO MILE 4.29
EXISTING: 400 FT. WIDE, 30 FT. DEEP
RECOMMENDED: 400 FT. WIDE, 35 FT. DEEP
PACIFIC
NORTH SPIT
NORTH BAY CHANNEL
WIDEN TURNS
RECOMMENDED: AT MILE 0.75, MILE 2.0
& MILE 2.60
ENTRANCE CHANNEL
SOUTH SPIT
NORTH
SCALE
1000 METERS
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR AND BAY
RECOMMENDED PROJECT PLAN
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
TRACED:
CHECKED:
FILE NO.
TO ACCOMPANY REPORT
DATED SEPT. 1975

PLATE 2

TABLE II-1
Maintenance Dredging
(Cubic Yards)

Year	Bar and Entrance	Fields Landing	North Bay	Samoa	Eureka
1965	878,300	43,200	-	-	99,600
66	1,059,300	106,100	107,300	-	43,940
67	527,500	22,200	19,560	-	85,470
68	473,100	30,500	28,800	-	79,900
69	534,000	73,500	-	-	-
1970	435,000	25,100	-	-	26,200
71	220,500	50,000	23,000	-	-
72	405,500	95,500	-	-	-
73	557,500	40,500	42,000	-	-
74	422,600	36,000	17,500	-	-
75	111,500	47,000	7,500	-	3,800
76*	234,800	-	-	-	-

* Up to June 1st.

2.009 Shoals in the bar and entrance channel require maintenance on a semi-annual basis. Other channel areas require less maintenance. The Samoa Channel is practically maintenance free, due to scouring tidal flows.

C. Channel Bottom Sediment Characteristics.

2.010 1. Corps Samples: Exploration of the Humboldt Bay bottom in the project area was conducted during May of 1971, June and July of 1974 and also in May of 1975. A total of 34 exploration holes were made in the project area and in adjacent areas to study the effect of possible movement of sediments in the Bay. The depth of holes varied from 1 to 23 feet below the existing Bay bottom and samples were taken for soils identification and pollutant testing.

2.011 The samples were 2-1/2-inch diameter in size and were taken in plastic liners located inside a push tube sampler. In some exploration holes, blow counts required to drive the 2-1/2-inch diameter sampler were recorded. The locations of the borings are shown on Plate 3. The results of the analyses are presented in Appendices 10, 11, and 12.

2.012 Soil and water samples from exploration holes were taken to the laboratories for chemical analysis of pollutants, sieve analysis and water content determination. Laboratory tests performed are presented in subparagraphs a, b, c and d.

2.013 a. Bulk Sediment Analysis. Tests for mercury, cadmium, lead, zinc, and oil and grease were run according to "Preliminary Sampling and Analytical Procedures for Evaluating the Disposal of Dredged Materials," Laboratory Support Branch, Environmental Protection Agency, Region IX, April 1974.

b. Standard Elutriate Test.

2.014 The test was run according to 40 CFR, Part 230, "Discharge of Dredge or Fill Material in Navigable Waters," Environmental Protection Agency. The tests for mercury, copper, cadmium, lead, zinc, and oil and grease were run according to methods for "Chemical Analysis of Water and Wastes," Environmental Protection Agency, National Environmental Research Center, Analytical Control Laboratory, Cincinnatti, Ohio.

c. Sieve Analyses.

2.015 The analyses were run according to Engineering Manual, EM-1110-2-1906, "Laboratory Soils Testing," 30 May 1970. Gradation curves of typical soils in North Bay, Eureka and Samoa channels are shown in Appendix 12.

d. Water Content.

2.016 Water content was determined for six samples.

e. Conclusions.

2.017 All samples in the bulk sediment analysis and all but four samples in the standard elutriate tests are within the maximum limits set by the Environmental Protection Agency, Region IX, for marine (shallow) and estuarine water disposal and 40 CFR, Part 230, Section 230.4.3 (1973). The four samples exceeding the pollution criteria are marked by an asterisk and are shown in Appendix 11. The Corps does not, at this time, recognize the 1975 regional interpretation of the 1973 criteria (see response at bottom of page 79).

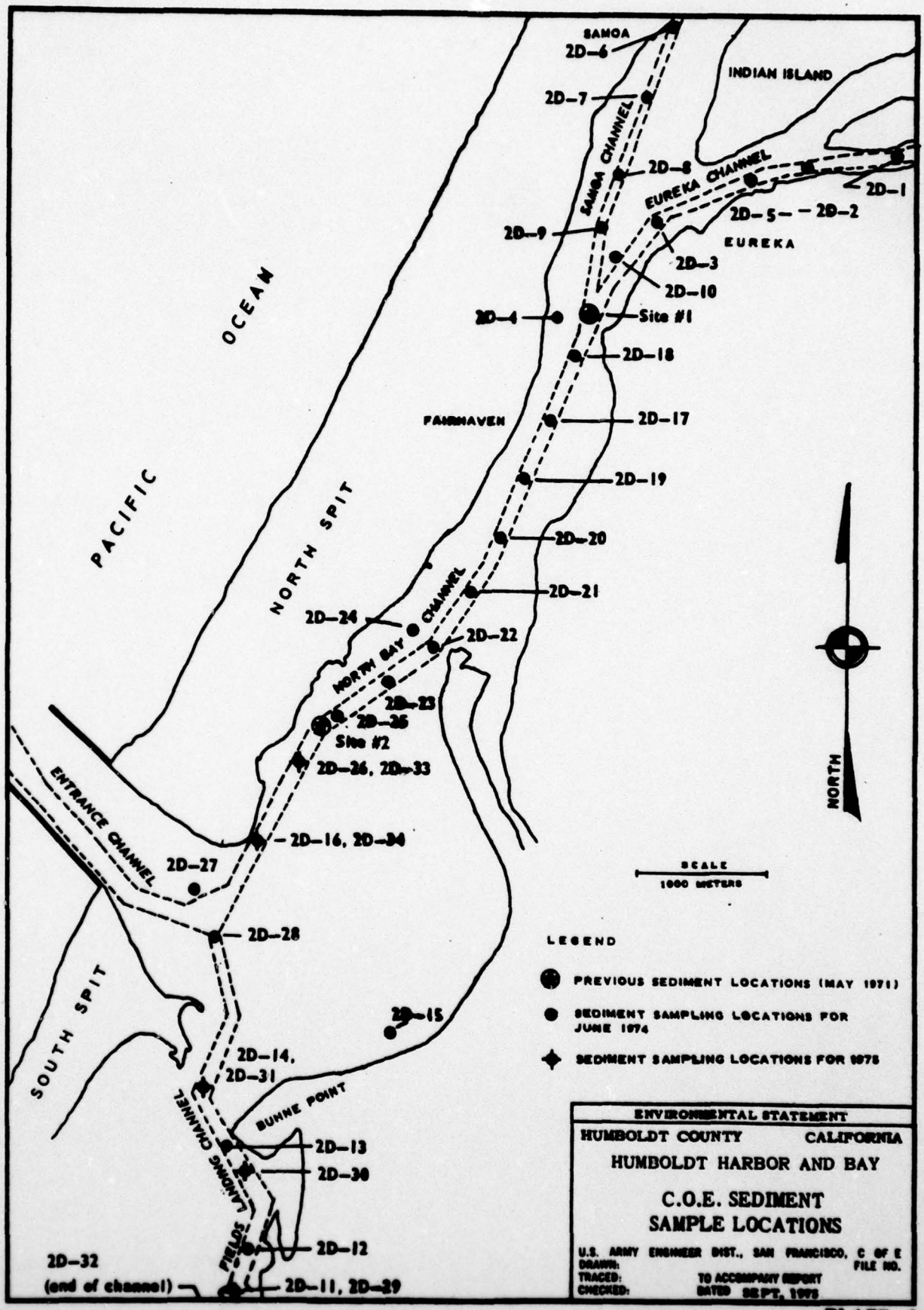
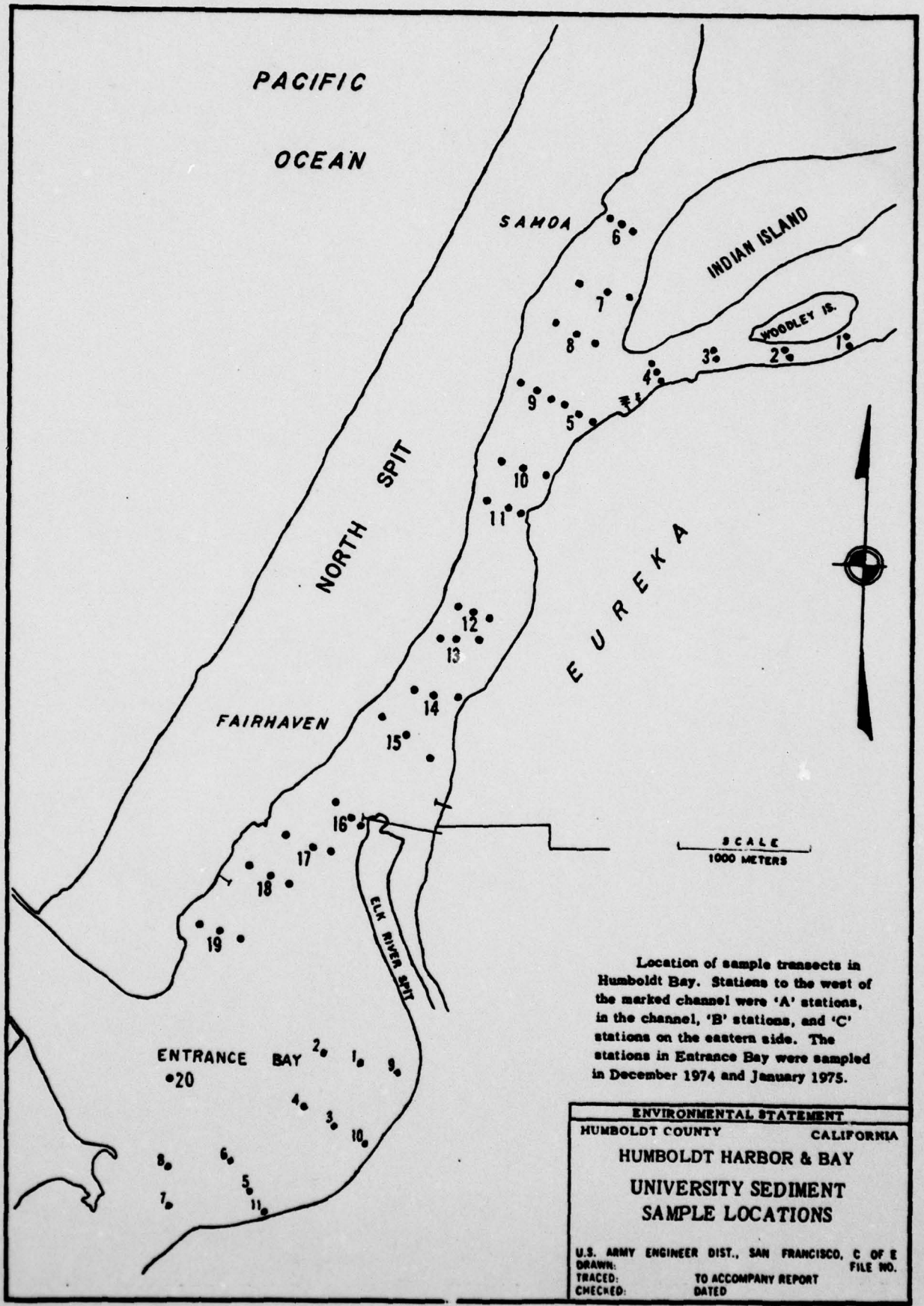

SAMOA
2D-6
INDIAN ISLAND
2D-7
SAMOA CHANNEL
2D-8
EUREKA CHANNEL
2D-1
2D-5
2D-2
2D-9
EUREKA
2D-3
2D-10
2D-4
Site #1
2D-18
OCEAN
FAIRHAVEN
2D-17
PACIFIC
NORTH SPIT
2D-19
2D-20
2D-21
2D-24
CHANNEL
2D-22
NORTH BAY
2D-23
2D-25
2D-26
Site #2
2D-26, 2D-33
ENTRANCE CHANNEL
2D-16, 2D-34
2D-27
2D-28
SOUTH SPIT
2D-15
2D-14,
2D-31
BUNNE POINT
LADOMS CHANNEL
2D-13
2D-30
FIELDS
2D-12
2D-32
(end of channel)
2D-11, 2D-29
NORTH
SCALE
1000 METERS
LEGEND
PREVIOUS SEDIMENT LOCATIONS (MAY 1971)
SEDIMENT SAMPLING LOCATIONS FOR JUNE 1974
SEDIMENT SAMPLING LOCATIONS FOR 1975
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR AND BAY
C.O.E. SEDIMENT SAMPLE LOCATIONS
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
TRACED:
CHECKED:
FILE NO.
TO ACCOMPANY REPORT
DATED SEPT. 1975

PLATE 3



Location of sample transects in Humboldt Bay. Stations to the west of the marked channel were 'A' stations, in the channel, 'B' stations, and 'C' stations on the eastern side. The stations in Entrance Bay were sampled in December 1974 and January 1975.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

UNIVERSITY SEDIMENT SAMPLE LOCATIONS

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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FILE NO.

TO ACCOMPANY REPORT
DATED

f. Channel Bottom.

2.018 Logs of exploration holes indicate the following channel bottom conditions for the proposed channel deepening project:

2.019 (1) North Bay Channel. The soils below the channel bottom consist of loose to dense sands with an occasional trace of silt, fine gravel and shell fragments.

2.020 (2) Eureka Channel. For most of the channel except in the north end, the channel bottom soils consist of loose to dense sands with an occasional trace of silt, fine gravel and some shell fragments. In the north end of the channel the bottom is underlain by soft clay.

2.021 (3) Samoa Channel. In the south end, the channel bottom is underlain by loose to dense sands with an occasional trace of silt, fine gravel and some shell fragments. Along the middle reach of the channel the bottom is underlain by silty sand containing shell fragments. In the north end of the channel the bottom is underlain by firm clay with shell fragments.

2.022 The above materials can be easily dredged and no dredging problems are anticipated.

2.023 2. University Samples: Samples were also taken by personnel from Humboldt State University in 1974 as part of a study of the benthic communities in the Bay. This study was done under contract with the Corps of Engineers, San Francisco District. Sample locations are shown in Plate 4, and the results are presented in Appendix 9.

2.024 The following procedure was used by the University to sample and analyze the sediments. On September 26-29, 1974, samples were collected from the North Bay, Samoa, and Eureka Channels of Humboldt Bay. On these dates, benthic grab samples and box cores were collected at 17 of the 19 cross-channel stations. The remaining two transects were sampled on October 5, 1974, and an additional station directly opposite the entrance to the Bay was also sampled.

2.025 At each A, B, or C substation, a Smith-McIntyre grab sampler was used to obtain three samples, each sample covering 1/10 m^2 of bottom area. The volume of each sample was determined immediately after each sample was removed from the grab. A Reineck box core sample 20 x 30 cm (600 cm^2) in area was also obtained, with the box core penetrating to variable depths.

2.026 A subsample was taken of each box core by inserting a two inch plastic core liner to a depth of 15 cm. This subsample was then used in the size analysis.

2.027 The analyses were carried out by standard techniques (Folk 1974). Samples consisting of greater than five percent silt and clay were pretreated in hydrogen peroxide, peptized, wet sieved on a 4ϕ (0.062 mm) screen and analyzed by pipette at full ϕ intervals through the silt sizes down to clay (finer than 8ϕ). The coarse fraction (> 0.62 mm) and the samples that were entirely sand and gravel were analyzed at 1/2ϕ intervals by sieving. A cumulative size curve was constructed for each sample and statistical parameters were computed using the graphic measures of Folk (1974).

2.028 No attempt was made to differentiate the terrigenous and biogenous components of the coarse sizes as all of the shell debris showed evidence of transport.

2.029 In order to better relate sediment characteristics with the environment, profiles were taken across each sample transect on October 29 and November 5, 1974, with a Portable Raytheon Fathometer mounted in a skiff. These profiles were corrected to scale and MLLW, and each station was then plotted on them (Appendix 1).

2.030 3. Comparison of Results: At first glance, examination of the results obtained from Corps studies and results from the University studies reveal slight discrepancies with respect to the percentages of silt and clay in the sediments. These differences are due to the varying locations in the channel and possibly to the methods of analysis and calculation. As can be seen from the University data, silt and clay composition varies widely from location to location even at the same distance from the mouth of the Bay. The two sets of results are consistent however, in that both indicate that North Bay Channel Sediments are at least 80% sand and gravel, and Samoa and Eureka Channels are generally 50-80% sand and gravel (see Plate 6).

D. Sedimentation.

2.031 The dynamics of Humboldt Bay are poorly understood. It is therefore difficult to draw any conclusions about sediment distribution, but some generalities can be pointed out.

2.032 The dominant agent of transport and sorting in the Bay appears to be tidal currents. These currents are strongest in the channels and velocities decrease northward from the Bay entrance. As the velocity of a tidal current decreases, its ability to carry a sediment load decreases and finer particles are deposited. The increase in silt and clay and the patterns of skewness and median size reflect this.

2.033 Samoa Channel drains perhaps 2/3 of the tidal volume of Arcata Bay. This high volume of water moving through the channel generates high current velocities. A few available measurements indicate a surface velocity of 100 cm/sec (2 knots) at peak ebb and flood tides (Casebier and Toimil 1973). Such velocities are competent to move particles up through coarse sand. This may explain why the sediments in Samoa Channel are coarser and contain less silt and clay compared to sediments in Eureka Channel.

2.034 Eureka Channel handles a much smaller tidal volume, hence lower current velocities prevail. Dredging activities have widened the channel, further decreasing current velocities. There is a well developed two-layer estuarine system in Eureka Channel for at least part of the year, which further increases deposition of finer particles. These conditions, coupled with a source of silt and clay (Freshwater Creek) explain the extreme siltiness and fine median size of sediments in this channel.

2.035 In many parts of the Bay the sediment contains a large gravel fraction (size greater than 2 mm), representing material from underlying coarse sand and gravel deposits that have been exposed by dredging. Evidence for this comes from the area of constriction in the North Bay Channel (Stations 12, 13, 14 of Plate 4) where the construction has resulted in increased current velocities that have scoured down into the bay floor. These stations are the deepest in the area and are highest in percentage gravel. Stations near modern sources of gravel (Elk River) also have high percentages of gravel.

2.036 In the North Bay Channel, deposition seems to be occurring on the western channel flank. The channel course in the area from Transects 19 to 14 (Plate 4) runs from the mouth of the bay to the north end of Elk River Spit, then turns slightly more northward and continues up to Arcata Bay. This suggests that deposition occurring on the west side of the channel in this area is similar to the outbuilding of a point bar. Where the channel bends, an area of back eddies and relatively quiet water exists in which deposition may occur. On the eastern side of the channel and north of Elk River a shadow zone exists where quieter water in the lee of Elk River Spit can deposit sediment. The plots (see Plate 5) of percent silt and clay bear out this hypothesis of deposition in these areas and show that Elk River is a significant contributor of sediment deposited in this way. South of Elk River Spit, waves become locally important geological agents in reworking and removing silt and clay from the bottom sediments. This can be seen in the plot of percent silt and clay for the eastern channel flank stations and is reflected in the low diversity benthic assemblages of this area.

2.037 Sources of sediments in Humboldt Bay appear to be threefold. (1), the creeks and rivers that enter the Bay carry at least locally important amounts of silt and clay into the system, and during flooding may carry some sand. (2), in some parts of the channels, dredging has exposed underlying deposits of sand and gravel which tidal currents may be able to redistribute (at least the sand). Finally, (3), much silt and clay (and presumably sand) enters the Bay from offshore on flood tides and is derived indirectly from the Mad and Eel Rivers (Thompson, 1971), (see Plate 7).

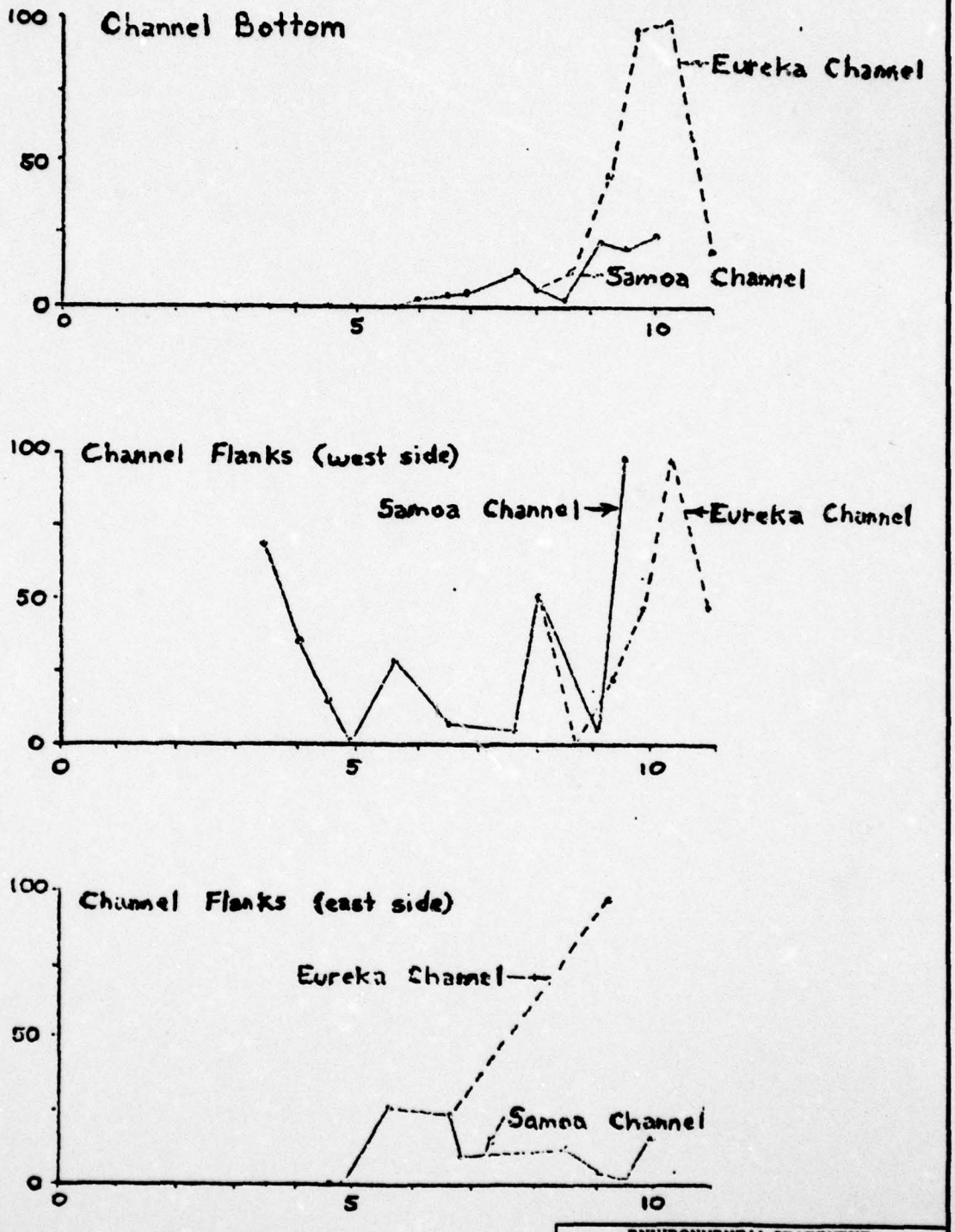
2.038 The percent silt and clay in samples was plotted against the distance of each station up-channel from the mouth of the Bay (Plate 5). The percent of silt and clay generally increases as distance from the mouth increases. This pattern parallels both the median size decrease and the change from negative to positive skewness. In the channel bottoms the increase is slight and continuous from North Bay Channel into Samoa Channel. Eureka Channel, however, shows a much higher silt and clay fraction, indicating higher rates of deposition in this channel (Plate 5).

2.039 Over the entire study area, eastern channel flank deposits have a low percentage of silt and clay near the mouth of the Bay as a consequence of wave action in this part of the Bay. Sediments of low silt and clay content continue up to the mouth of Elk River. Northward of the Elk River mouth, percent silt and clay increases steadily in eastern channel flank sediments. The western channel flank deposits show an increase in percent silt and clay both north and south of Station 16A. This again is near the entry of Elk River into the Bay and implicates the Elk River as a source of finer sediments in and near the North Bay Channel.

E. Geology.

1. Introduction

2.040 Until late Pleistocene time, the area occupied by Humboldt Bay consisted of coalescing flood plains of the Mad River, Freshwater Creek and Jacoby Creek on the north, and Elk River and Salmon Creek on the south. Subsequently, the recession of the continental glaciers, along with subtle crustal adjustments, caused a substantial rise in sea level and the gradual inundation of the lower portions of the coalescing flood plains. Shoreline bars then developed along the coast of the drowned valleys to form the present seaward margin of Humboldt Bay. These northeast trending, long-shore drift controlled sand spits separate Humboldt Bay, along its entire length, from the Pacific Ocean and are almost continuous except for a narrow bay entrance located near the central portion of the Bay.



The percentage of silt and clay found in and along the sides of channels in the study area.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

PERCENT SILT & CLAY IN SEDIMENTS

(UNIVERSITY SAMPLES)

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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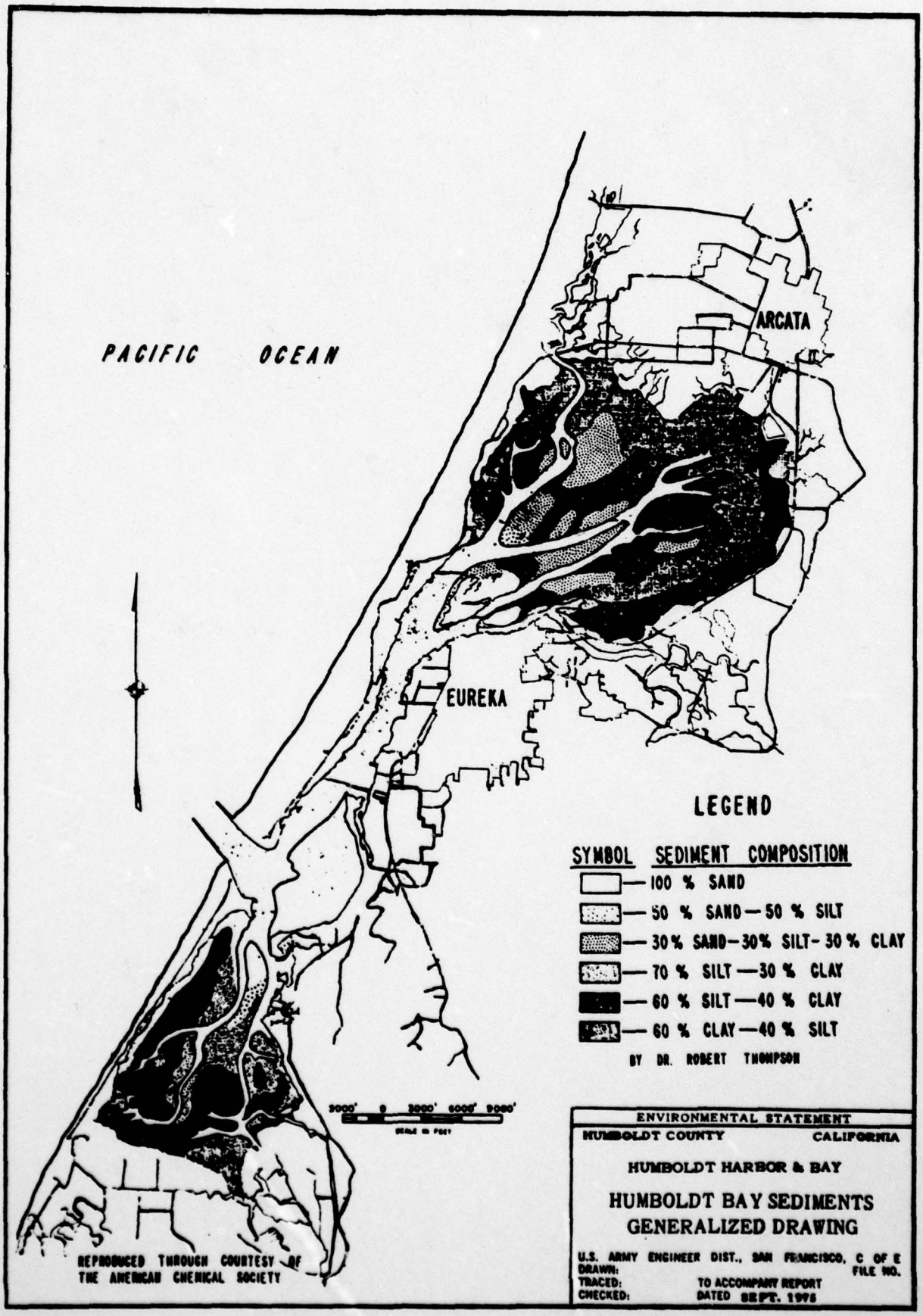
PLATE 5


PACIFIC OCEAN
ARCATA
EUREKA
LEGEND
SYMBOL SEDIMENT COMPOSITION
100 % SAND
50 % SAND — 50 % SILT
30 % SAND — 30 % SILT — 30 % CLAY
70 % SILT — 30 % CLAY
60 % SILT — 40 % CLAY
60 % CLAY — 40 % SILT
BY DR. ROBERT THOMPSON
3000' 0 3000' 6000' 9000'
REPRODUCED THROUGH COURTESY OF THE AMERICAN CHEMICAL SOCIETY
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR & BAY
HUMBOLDT BAY SEDIMENTS
GENERALIZED DRAWING
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
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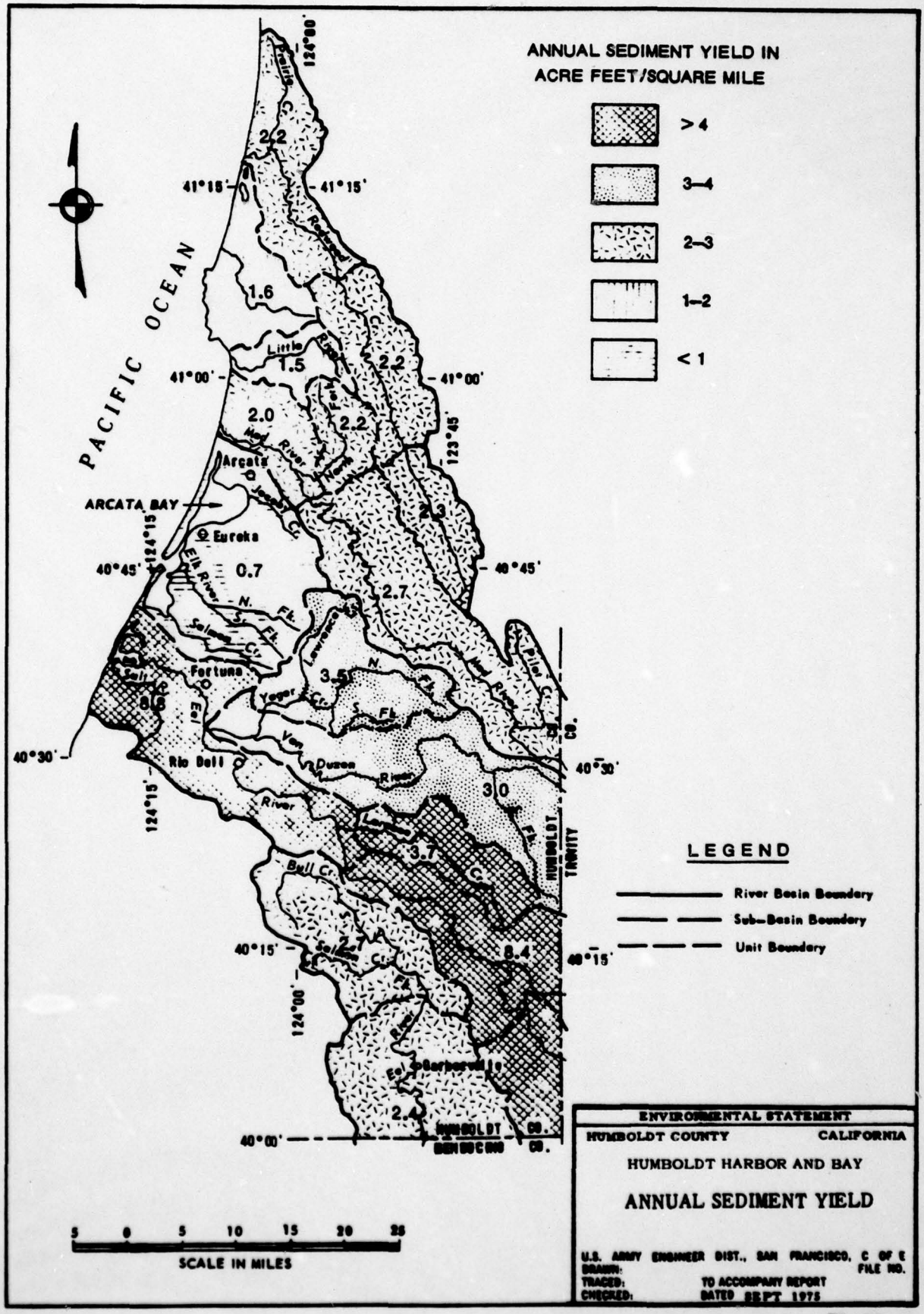
TO ACCOMPANY REPORT
DATED SEPT. 1975

PLATE 6


ANNUAL SEDIMENT YIELD IN
ACRE FEET/SQUARE MILE
> 4
3—4
2—3
1—2
< 1
PACIFIC OCEAN
ARCATA BAY
Arcata
Eureka
Fortuna
Rio Dell
Prairie Cr.
Redwood Cr.
Little
Mad River
Jacoby Cr.
Elk River
N. Fk.
S. Fk.
Salmon Cr.
Lawrence Cr.
Yager Cr.
Van Duzen River
Pilot Cr.
Bull Cr.
Eel River
Eel
Barberville
HUMBOLDT CO.
TRINITY CO.
41°15'
41°00'
40°45'
40°30'
40°15'
40°00'
124°00'
124°15'
123°45'
2.2
1.6
1.5
2.2
2.0
2.2
2.3
0.7
2.7
3.5
0.8
3.0
3.7
8.4
2.4
LEGEND
River Basin Boundary
Sub-Basin Boundary
Unit Boundary
5 0 5 10 15 20 25
SCALE IN MILES
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR AND BAY
ANNUAL SEDIMENT YIELD
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
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FILE NO.
TO ACCOMPANY REPORT
DATED SEPT 1975

PLATE 7

AD-A061 540 CORPS OF ENGINEERS SAN FRANCISCO CALIF SAN FRANCISCO--ETC F/G 13/2
ENVIRONMENTAL STATEMENT, NAVIGATION IMPROVEMENT HUMBOLDT HARBOR--ETC(U)
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2 OF 4
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2.041 Miocene to Pleistocene age sediments are exposed in the hills adjacent to Humboldt Bay forming a series of northwest trending folds that plunge westward beneath the Bay area. Late Pleistocene to recent alluvial and deltaic sediments have accumulated to cover and fill the drowned portions of the folds and troughs. These sediments underlie the present water of the bay and adjoining tidal areas, marshland and deltas at the mouths of tributary streams. The sediments are composed of mixtures of loose, unconsolidated sands, silts, clays, and some gravel layers. The total thickness of these beds below the waters of the bay is unknown, however, water well logs of borings in areas adjacent to main channels indicate that the thickness is approximately 130 feet in the South Bay and the narrow central portion of Humboldt Bay, and exceeds 375 feet along the eastern shoreline of Arcata Bay.

2.042 Surface sediments within the main tidal channels are predominantly fine grained sand containing shells and some gravel. Exceptions to this include the Eureka Inner Channel and the extreme northern portion of the Samoa Channel where the bay bottom sediments are comprised of silts and organic clays. The tidal flats consist mostly of mixtures of clays and silts while the salt marsh areas contain organic silty clays and peat-like deposits.

2.043 Humboldt Bay is situated between the Freshwater fault on the north and east, and the Little Salmon-Table Bluff faults to the south. Two faults, that are considered as possible branches or continuations of the Little Salmon fault, pass under the Bay near the Bay entrance and the south end of the North Spit. Recent studies indicate that at least some portions of these faults may have undergone movement within the past two million years, however, no evidence of recent surface displacement has been discovered. (See Plate 8, Geology and Plate 10, Humboldt Bay Cross-Section.)

2. Groundwater

2.044 Groundwater bodies in the Humboldt Bay region occur principally within the recent alluvium and dune sand deposits, unconsolidated Pleistocene terrace deposits, and the poorly consolidated Pleistocene Hookton and Plio-Pleistocene Carlotta formations. The primary aquifers around the immediate periphery of the bay consist of alluvial deposits, and Hookton and Carlotta formations, and the dune sands that form the western shoreline of the Bay.

2.045 The thickness of the alluvial deposits varies from 130 feet to over 375 feet with fresh water produced mainly from various horizons at shallow depths of less than 70 feet below the ground surface. The Hookton and Carlotta formations produce water both by artesian flow and from various depths to over 600 feet.

2.046 In the North Barrier Spit (Samoa Peninsula) bodies of fresh water float on salt water as a result of the lower specific gravity of the fresh water. Fresh water has been produced from near the surface to depths of over 70 feet. No fresh water has been discovered to date in the South Barrier Spit. The total thickness of the dune sands comprising the spits is unknown, but is thought to be in excess of 100 feet.

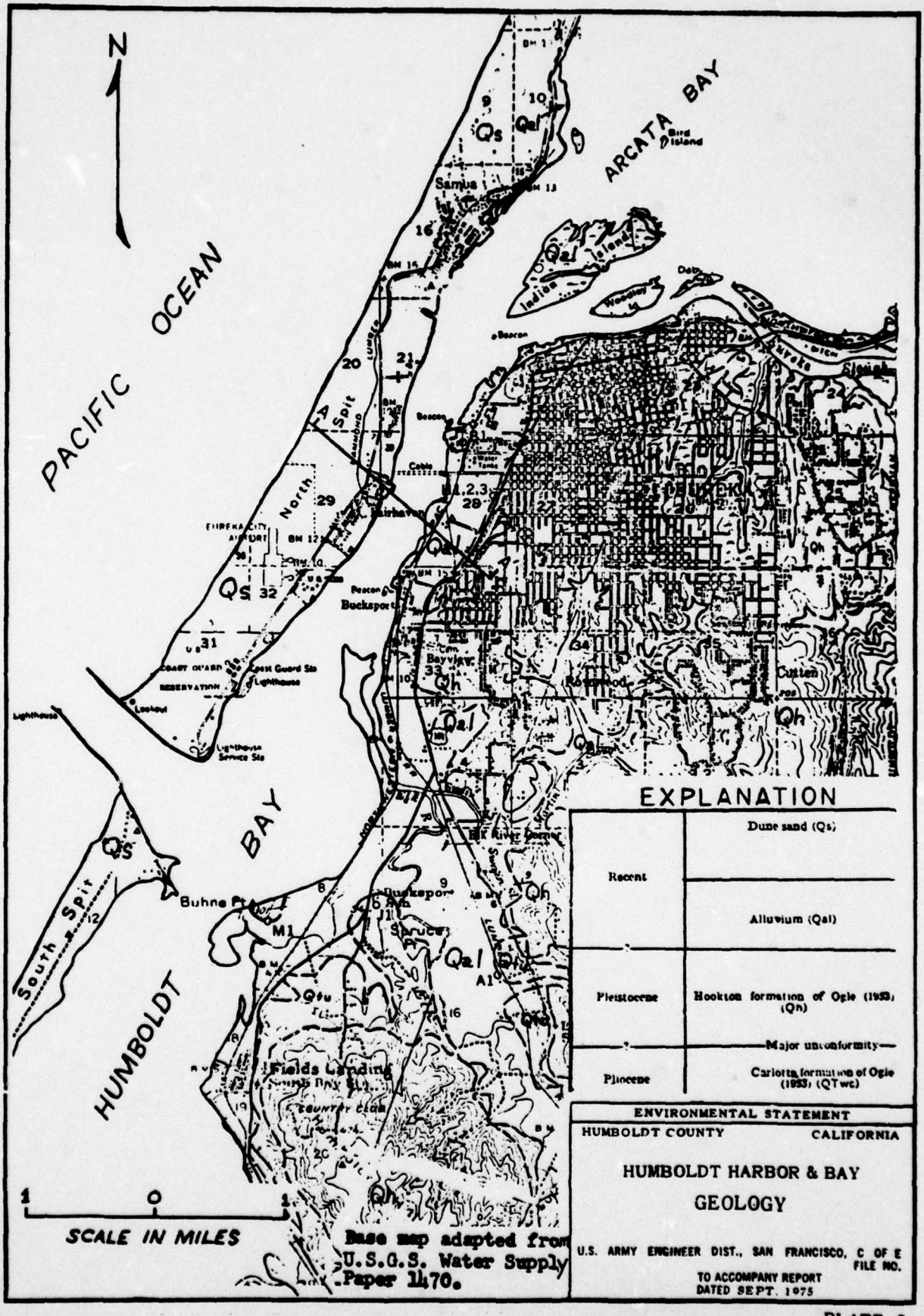
2.047 Groundwater recharge of the alluvial deposits and the Hookton and Carlotta formations results mainly from deep percolation of rainfall along with upstream seepage from adjacent streams and rivers. However, recharge of the fresh water bodies within the coastal dune sands is almost entirely from deep percolation of rainfall.

2.048 Saltwater encroachment has occurred in portions of alluvial deposits north of Arcata Bay along areas adjacent to the Mad River slough and within surficial deposits along the tidal reach of streams flowing into the Bay. Groundwater in the alluvium, terrace deposits and Hookton and Carlotta formations is predominantly calcium magnesium bicarbonate type water. However, as a result mostly of the diffusion of saltwater across the interface between the fresh water and saltwater and by percolation of precipitation over dissolved salts deposited by ocean spray, the water in the North Spit is of the sodium chloride type. Under existing conditions, the sands of the North Spit are open to intrusion by saline water on both the seaward and bay sides.

2.049 Groundwater has been an important source of water on the Samoa Peninsula (North Spit). It provided the principal water supply to the United States Coast Guard installation located near the south end of the peninsula as well as for numerous industrial and other domestic users situated along the north spit. However, at the present time, a major portion of the water required on the peninsula, including the Coast Guard installation, is supplied through a local municipal water district which imports water from the Mad River. Groundwater is still utilized in some areas of the peninsula, but the demand for it appears to be diminishing due to the current availability of higher quality imported water.

3. Seismicity

2.050 Humboldt Bay is located near one of the most seismically active regions in California. The majority of the earthquakes occur on active faults in the ocean floor off the coast of Cape Mendocino and extending seaward along the Gorda Escarpment in an area about 50-80 miles southwest of Eureka. (See Plate 9, Earthquake Epicenters.) A branch of the active San Andreas Fault Zone extends inland at Shelter



EXPLANATION

Recent	Dune sand (Qs)
	Alluvium (Qal)
Pleistocene	Hookton formation of Ogle (1953) (Qh)
	Major unconformity
Pliocene	Carlotta formation of Ogle (1953) (QTwc)

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

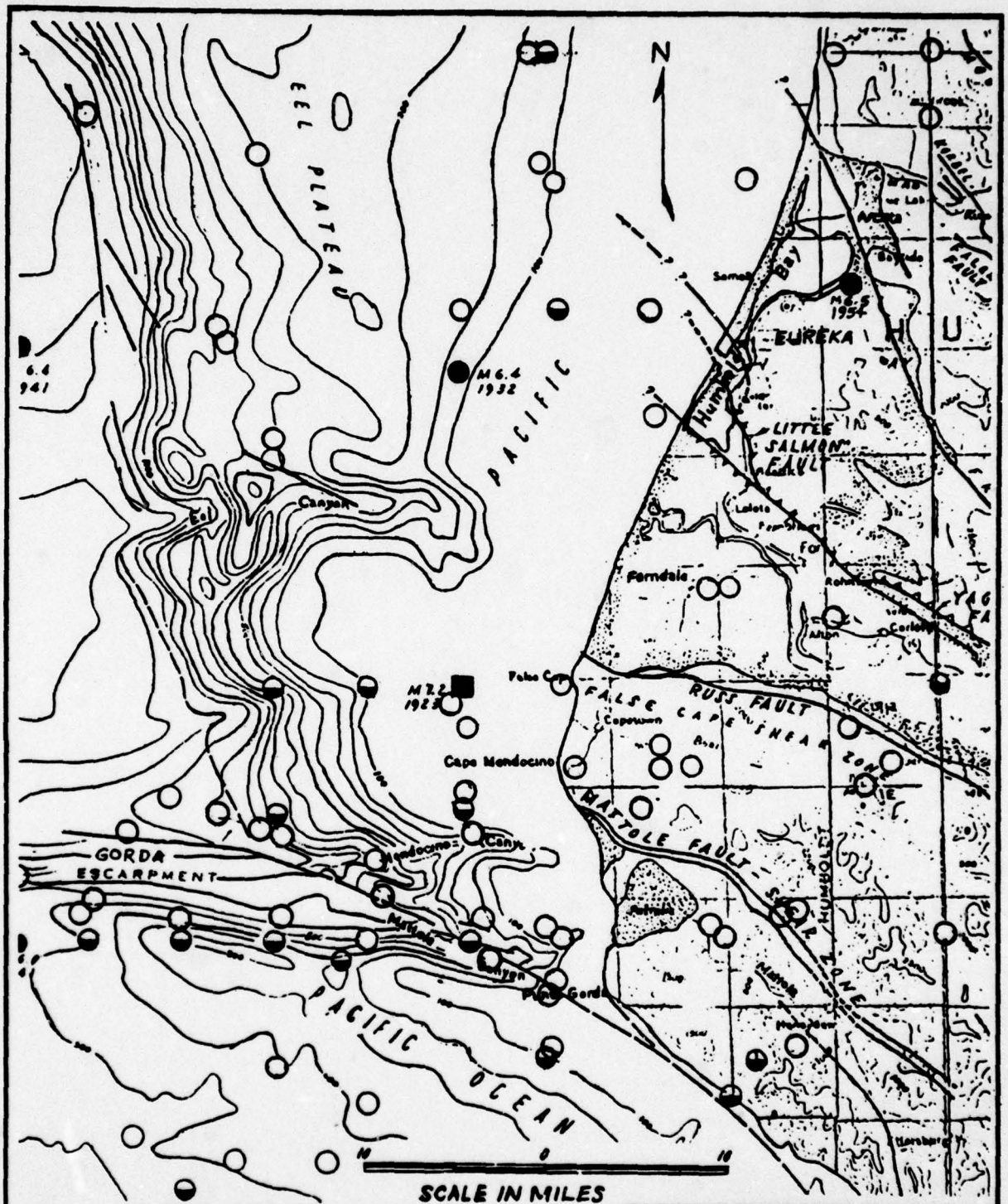
GEOLOGY

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

FILE NO.

TO ACCOMPANY REPORT DATED SEPT. 1975

PLATE 8



EXPLANATION

- ○ Magnitude 4.0 - 4.9
- ◒ Magnitude 5.0 - 5.9
- ● Magnitude 6.0 - 6.9
- ■ Magnitude 7.0 - 7.9

Note: Period of record 1934-1971 with selected earthquakes prior to 1934 noted.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

EARTHQUAKE EPICENTERS

IN SHEET SHEET NO.

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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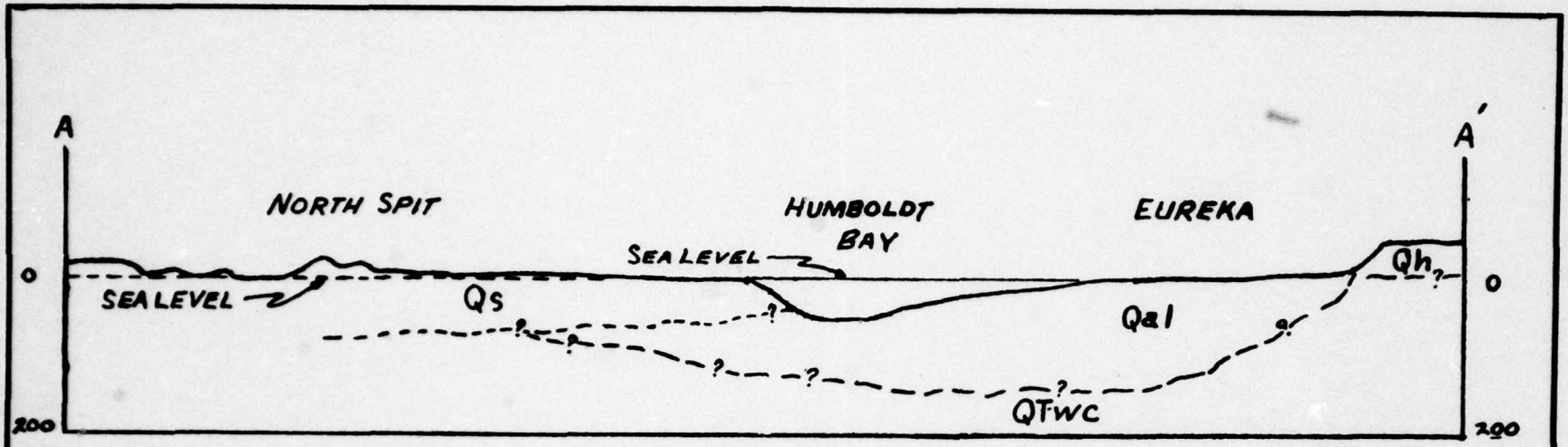
PLATE 9



GEOLOGIC SECTION AA'

1000 0 1000

SCALE IN FEET

VERTICAL SCALE 5 TIMES HORIZONTAL SCALE

EXPLANATION

Recent	Dune sand (Qs)
	Alluvium (Qal)
?	
Pleistocene	Hookton formation of Ogle (1953) (Qh)
?	Major unconformity
Pliocene	Carlotta formation of Ogle (1953) (QTwc)

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

HUMBOLDT BAY

CROSS-SECTION AA'

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

TO ACCOMPANY REPORT FILE NO.

DATED SEPT. 1975

PLATE 10

Cove some 50 miles southwest of Eureka while the main fault zone swings northwestward to intersect the Mendocino Fault Zone. The Freshwater Fault, located south of Arcata and projected beneath Arcata Bay is considered active by some, postulated on the assumption that it may have been the source of a 1954 magnitude 6.5 earthquake. Clusters of epicenters suggest that other faults in the area may be active at depth.

2.051 Statistically, this region experiences three or four magnitude 4.0-4.9 events per year; one magnitude 5.0-5.9 event per year; one magnitude 6.0-6.9 event every 5 years and one major event greater than magnitude 7.0 every 28 years.

2.052 Since Humboldt Bay is within a seismically active region, it can be expected that this area may be subjected periodically to shocks of varying intensity as a result of continued seismic activity originating from the San Andreas Fault Zone and the offcoast Cape Mendocino area.

Liquefaction Potential

2.053 Liquefaction potential is generally associated with cohesionless unconsolidated, saturated, fine grained sandy sediments. Based on logs of borings that show the distribution of sediments, the project reach is underlain predominantly by fine grained sands with some areas of silt and clay. The areas underlain by sands and silts may experience liquefaction as a result of ground motions originating from earthquakes in the region. Liquefaction of these sediments could result in subaqeous landslides along channels and/or varying degrees of differential settlement in adjacent bay bottom areas.

4. Tsunami Potential

2.054 Tsnunamis are sea waves generated principally by seismic disturbances. Historically, the tsunamis that have reached the California coast originated as a result of distant earthquakes. California earthquakes have not produced any recorded tsunamis. The most recent tsunamis to strike the northern California coast occurred in the years 1960 and 1964. Moderate to severe damage with loss of life occurred at Crescent City to the north while Humboldt Bay incurred little or no damage as a result of the seismic induced waves. Inundation of lowlying peripheral areas of the Bay did not occur during either tsunami; however, potentially damaging, strong currents resulted from the rapid changes in the water level within the Bay. Although tsunamis have reached Humboldt Bay only infrequently in the past, the possibility exists for future recurrence of tsunamis.

F. Climate.

2.055 The area in the vicinity of Humboldt Bay and Eureka, California, experiences moderate temperatures and considerable precipitation. Average temperatures along the coast vary only 10°F from summer to winter. Temperatures of 32°F or lower are experienced nearly every winter throughout the area and maximum readings for the year seldom exceed 80°F on the coast. Average seasonal precipitation in Eureka totals about 50 inches per year, primarily rainfall with light and infrequent snowfalls. The climatic parameters of the Humboldt Bay region are influenced and determined by the Pacific Ocean. Severe storms, winds and squalls occur frequently along the coast, particularly during the winter season. Heavy fogs occur in this area most frequently during July, August and September. December and January are relatively free of foggy weather.

G. Vegetation.

2.056 Appendix 2 lists benthonic algae (seaweed) in the Humboldt Harbor and Bay Area. Large brown algae predominate in the coastal waters near the Bay although green algae and some red algae are found to a lesser extent. Large algae (kelp) require a solid foundation for anchorage during part of their life cycle. Most of the larger kelps are brown algae which flourish in the temperate climate and cold waters of northern California. While few marine organisms feed directly upon the kelp, these plants create an essential habitat. Kelp beds could be called the "Forests of the Sea" since they provide protective cover, hiding places, and food for small organisms. Kelp beds at the same time provide feeding areas for larger species of fish attracted by the small organisms. Kelp beds are found north and south of Humboldt jetties where they have a solid foundation for anchorage.

2.057 The Humboldt Bay area is influenced by a variety of vegetational habitat types. Dominant among those is the famous redwood forest stands found along the coastal mountain ranges and hinterlands immediately east of the Bay. The next most prominant habitat type is the urban-agricultural land. This area is comprised of urban and suburban developed lands as well as those lands involved in some type of agriculture. The coastal dune vegetation is characteristic of those areas influenced by oceanic conditions and sandy areas. Coastal brushfield habitat can be found in the surrounding hills mixed with redwood forests and Douglas fir forest. Woodland-prairie and Douglas-fir forest vegetation can be found within a short distance of the Bay area.

2.058 Plate 11 shows the vegetal cover types of the area, and Plate 18 shows the habitat types. A Soil Conservation Service General Land Capability Map is shown on Plate 20. The disposal sites are classified as Type VIIIe, which is described on Plate 20.

2.059 More details on the coastal dune vegetation may be found in Section IV-B under a discussion of the impact of disposal on that community.

H. Benthic Resources.

2.060 Humboldt Bay and its entrance jetties provide an extremely valuable habitat for shellfish. Extensive clam beds exist throughout most of the intertidal area of the Bay with several species of clams occurring subtidally as well. Seven of California's 12 shellfish reserves are in Humboldt and Arcata Bays, (Plate 12). These areas of state land within the bay have been set aside for clam digging and native oyster taking by the public. Oyster culture is the largest commercial fishing activity in Humboldt Bay. During 1970, commercial fishing boat landings totalled over 18.7 million pounds of shellfish in the Eureka area.

2.061 The following information on benthic resources is taken from a study done under contract to the San Francisco District of the Corps of Engineers (Boyd, 1975).

2.062 A total of 141 species were encountered in samples from the 88 substations enumerated. Numbers of species in major taxonomic groups can be summarized as:

Phylum Annelida		Phylum Mollusca	
Class Polychaeta	57 species	Class Gastropoda	12 species
Class Oligochaeta	2 species	Class Bivalvia	17 species
Phylum Arthropoda		Phylum Echinodermata	
Class Crustacea	31 species	Class Asteroidea	1 species
Class Pycnogonida	3 species	Class Echinoidea	1 species
		Class Ophiuroidea	2 species
		Class Holothuroidea	2 species
Phylum Ectoprocta (Bryozoa)	4 species	Phylum Sipunculida	1 species
Phylum Phoronida	2 species	Phylum Nemertea	4 species
Phylum Cnidaria (Coelenterata)	1 species	Phylum Porifera	1 species

2.063 A detailed listing of species is contained in the final report (Boyd, 1975). The species were statistically grouped into assemblages, as described below.

2.064 The Eureka-Samoa assemblage is characterized by the presence of the species listed below. These species occur in shallow water associated with sediments relatively high in silt-clay fraction. The polychaetes and molluscs are infaunal organisms, while the one crustacean characteristic of this assemblage (Diastylopsis dawsoni), lives at the mud-water interface. There is a relationship of this group to the North Bay Channel group by the common co-occurrence of the predatory polychaete Nephtys californiensis and the widely occurring bivalve Transennella tantilla.

Polychaeta

Capitita ambiseta
Lysilla sp.
Heteromastus longicornis

Mollusca

Lyonsia californica
Macoma nasuta
Mysella tumida

Crustacea

Diastylopsis dawsoni

Species encountered also in the North Bay Channel assemblage:

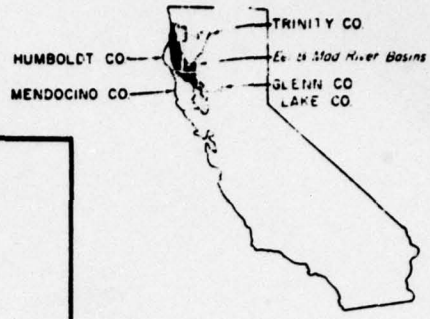
Polychaeta

Nephyts californiensis

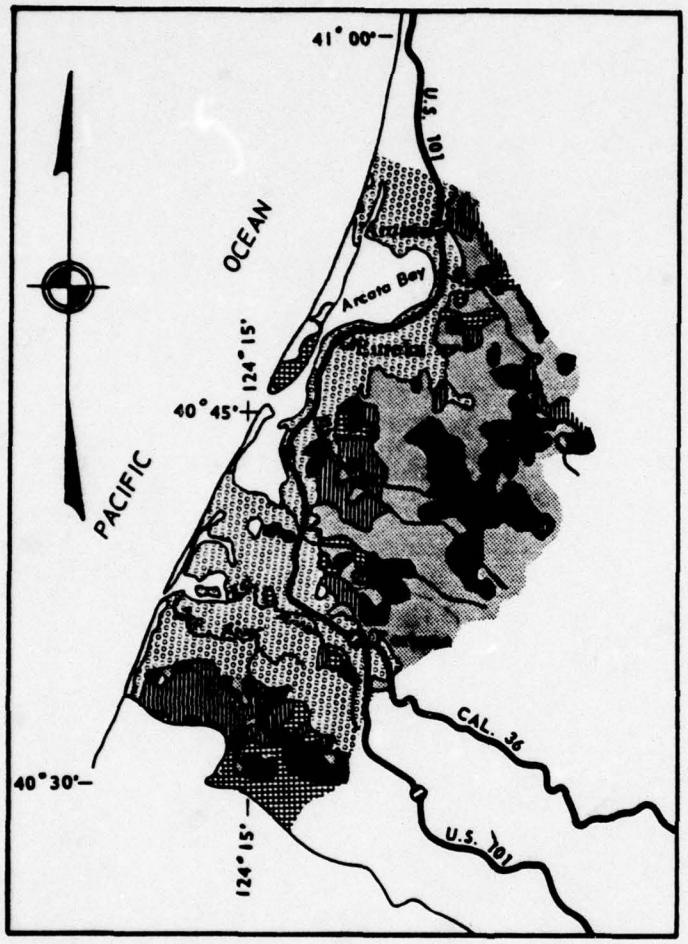
Mollusca

Transennella tantilla

2.065 The North Bay Channel assemblage is characterized by the presence of the species listed below. These species appear to occur in deeper water than the Eureka-Samoa assemblage and are associated with sediments showing a greater than 50 percent sand fraction. Sediments of this character are confined to the central portion of Humboldt Bay, extending from just south of Eureka to approximately Field's Landing. Some species found in sediments of this character are often taken by sport fishermen, for example the basket cockle Clinocardium nuttallii and the gaper clam Tresus capax. These organisms are rare in the coarser sand sediments of the Entrance Bay. It was also within the North Bay Channel area that the largest numbers of organisms per sample were encountered (Plate 13).



LOCATION MAP



LEGEND

- Conifer
- Woodland
- Brush
- Grass
- Barren
- Cultivated, Urban and Industrial

5 0 5 10

SCALE IN MILES

January 1968

SOURCE: Data from USDA–SCS, Portland, Oregon

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

VEGETAL COVER TYPES

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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CHECKED: DATED SEPT 19 .

PLATE 11

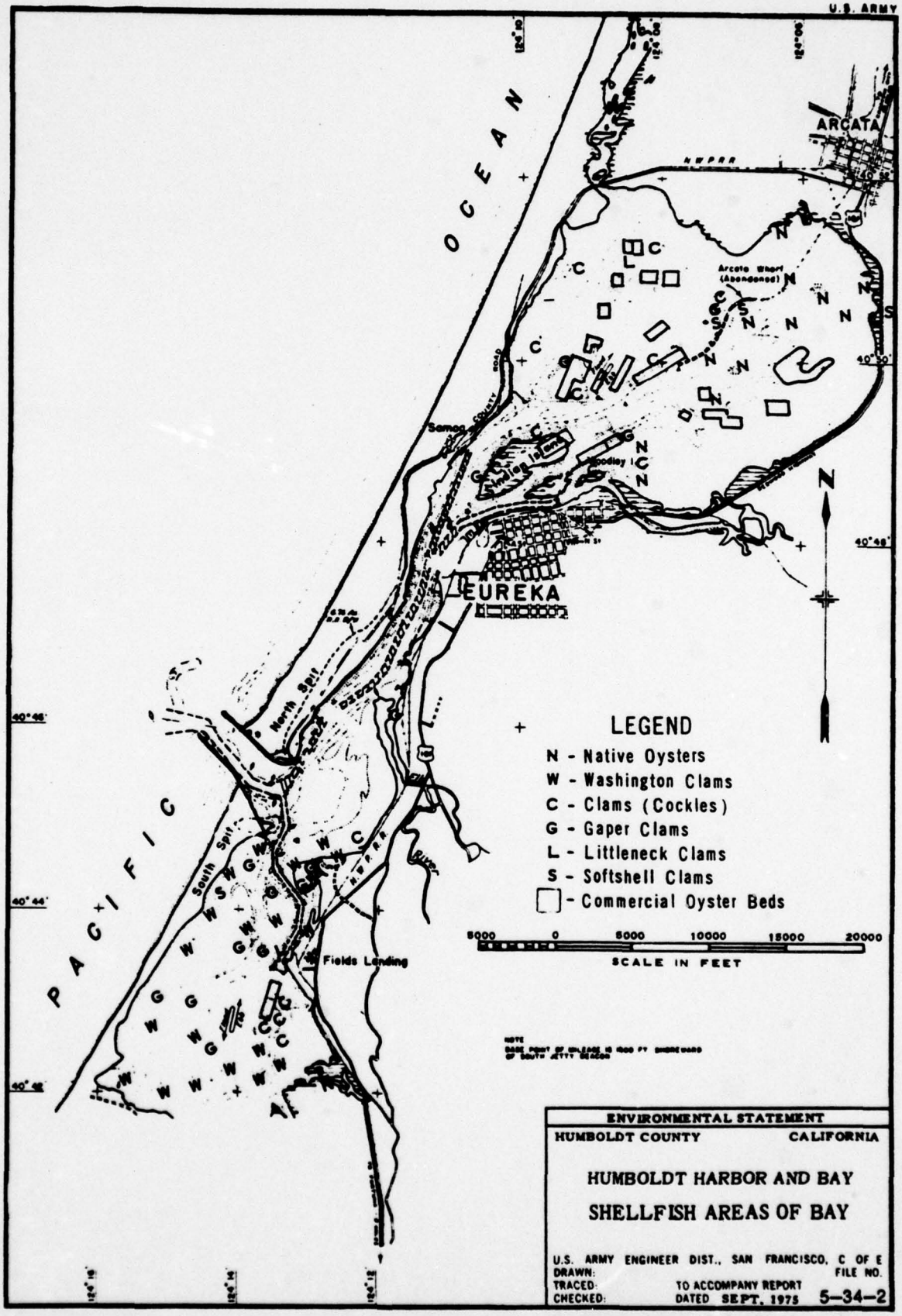
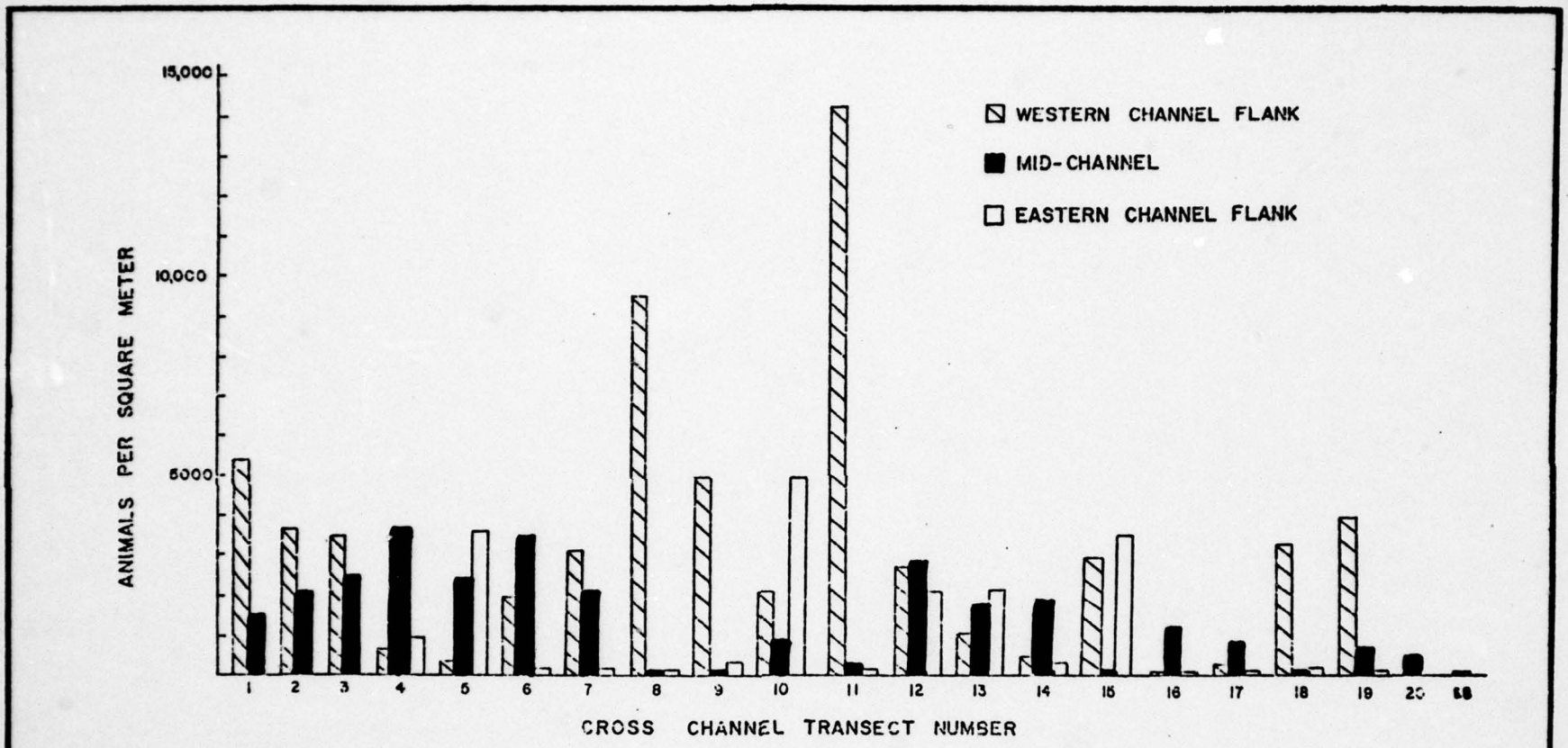

U.S. ARMY
OCEAN
ARCATA
EUREKA
Arcata Wharf (Abandoned)
Samoa Cookery
Woodley Island
North Spit
South Spit
Fields Landing
PACIFIC
40°48'
40°44'
40°40'
LEGEND
N - Native Oysters
W - Washington Clams
C - Clams (Cockles)
G - Gaper Clams
L - Littleneck Clams
S - Softshell Clams
- Commercial Oyster Beds
5000 0 5000 10000 15000 20000
SCALE IN FEET
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR AND BAY
SHELLFISH AREAS OF BAY
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
TRACED:
CHECKED:
TO ACCOMPANY REPORT
DATED SEPT. 1975
FILE NO.
5-34-2

PLATE 12



Density of benthic organisms in North Bay, Eureka, and Samoa Channels. Mean density for Entrance Bay (EB) stations is included. 1/10 m^2 samples adjusted to organisms per m^2.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

DENSITY OF

BENTHIC ANIMALS

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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CHECKED: DATED

PLATE 13

Polychaeta

Anaitides williamsi
Haploscolopolos elongatus
Ophelia magna
Polydora socialis

Mollusca

Adula diegensis
Alvinia sp.
Clinocardium nuttallii
Macoma inquinata

Crustacea

Tritella pilimana

Species encountered also in the Entrance Bay assemblage:

Polychaeta

Glycera tenuis

Mollusca

Tresus capax
Nassarius fossatus

2.066 The Entrance Bay assemblage is depauperate both in species and numbers of organisms per sample. The areal coverage of this group is from the mouth of Elk River into the central portion of Humboldt Bay. Benthic species characteristic of this assemblage are listed below.

2.067 Species characteristic of stations in the central portion of Humboldt Bay from the mouth of Elk River to the Entrance Channel include:

Polychaeta

Glycera tenuis
Glycinde polygnatha

Mollusca

Nassarius fossatus
Olivella biplicata
Olivella pycna
Tellina nuculoides

2.068 Several of the species encountered as part of this mid-bay assemblage are also characteristically found on sandy substrates in water of 40-60 feet depth off the Humboldt County coast. Their presence in the Bay emphasizes the physically dynamic, essentially marine character of central Humboldt Bay.

2.069 Brief mention should be made of species which tend to occur in samples from many of the 88 substations. These species can be characterized as "generalists" in that their habitat requirements appear to be fairly flexible. As such, they are of little use in constructing

recurrent groups or assemblages of organisms. They may, however, be locally abundant in one of a few stations, frequently widely scattered. Some possible generalist species are listed below:

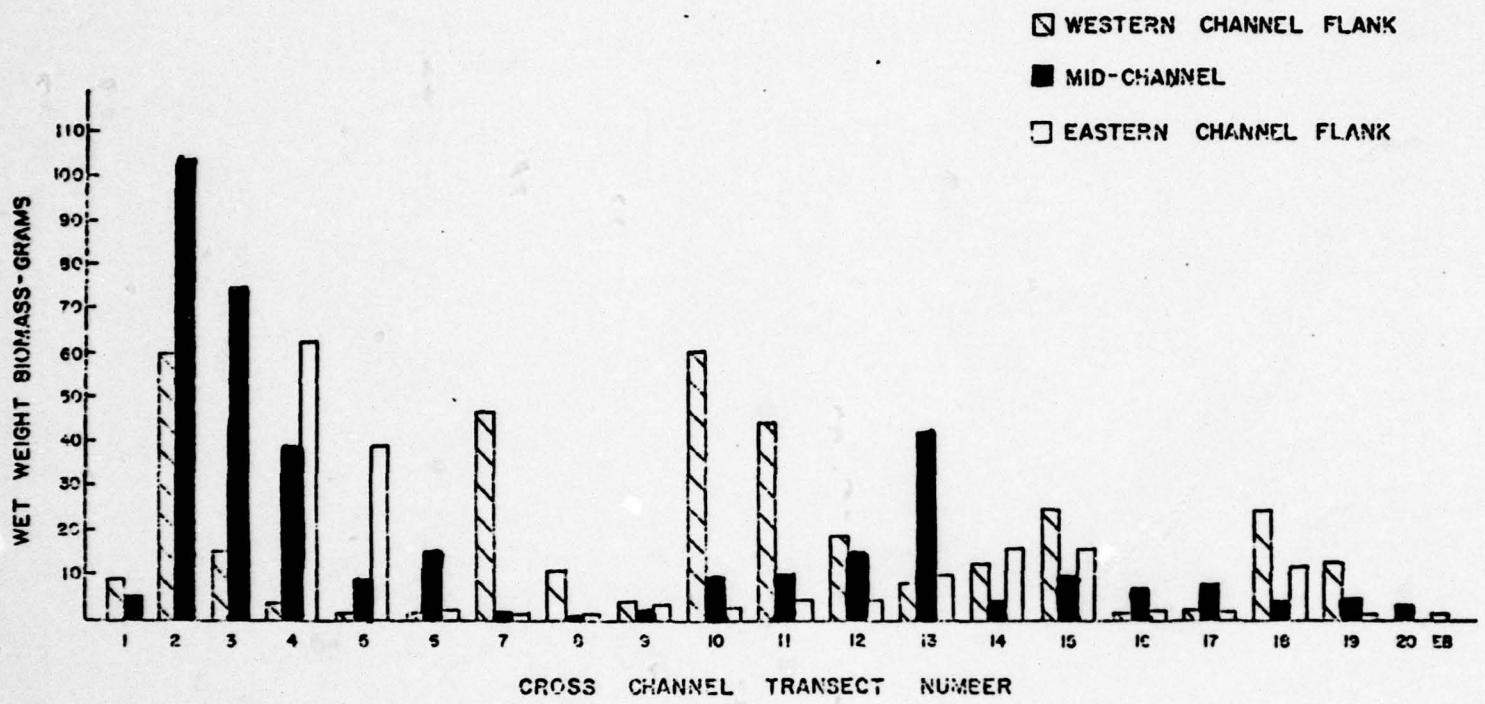
2.070 Species occurring at numerous stations in Humboldt Bay and classified as "generalists" include:

Polychaeta	Crustacea
Chilonereis cyclurus	Caprella californica
Eupolymnia crescentis	Lamprops sp.
Owenia collaris	Photis brevipes
	Megamphopus martesia

2.071 It is difficult to relate diversity convincingly to the recurrent assemblages identified by computer analysis. There does appear to be a relationship to the position of the samples in relation to the main channel. Samples on the western side of the three channels show highest mean diversity, followed by samples in the main channels, with samples along the eastern side of the channels having lowest mean diversity. This pattern is probably related to the sediment transport dynamics along the channels. Areas adjacent to channels on the eastern side are eroding gradually, while areas to the west of the channel are accumulating sediment gradually. The channel bottom appears to support a relatively diverse assemblage of organisms at present. The channel bottom stations are not significantly different from those on the western channel flank, but are different from those on the eastern channel flank. The eastern channel flank stations are less diverse, indicating that erosional processes have been significant in restricting the establishment of diverse communities along the eastern channel flank.

2.072 The least diverse group of stations sampled were in Entrance Bay. The jetties at the bay entrance appear to be directing wave shock to the area between Elk River Spit and Buhne Point. The sediments are coarse, indicating a dynamic bottom environment which can be colonized by only a few species.

2.073 Biomass Estimation: One sample from each replicate series was sorted to major taxonomic categories and wet weight biomass determined. The results indicate a trend, with the highest biomass present at stations from the Eureka and Samoa Channels, and lesser biomass values at stations closer to the mouth of the Bay (Plate 14). In terms of major taxonomic groups, bivalves molluscs accounted for the greatest biomass in the summed samples (75.1%), followed by polychaetes (11.9%), phoronids (6.0%), and gastropods (1.2%).



Wet weight biomass per 1/10 m^2 Smith-McIntyre grab samples in Humboldt Bay.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

BIOMASS OF BENTHIC ANIMALS

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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CHECKED: DATED

PLATE 14

I. Fish Resources.

2.074 Humboldt Bay provides habitat for 95 species of fish representing 41 families. Some species spend their entire lives within the Bay, while others migrate out after maturation and some are just casual visitors. The Bay provides a nursery area for many juvenile fishes of many species. The seven-gill shark found in the deeper portions of the Bay is Humboldt Bay's largest fish attaining at least nine feet in length. The leopard shark and brown smoothhound are fish common to Humboldt Bay anglers as they are caught in the bay channels and tidal flats. The bat ray is another fish found in the tidal flats and channels. It is a predator of oysters, clams, and crabs (particularly destructive to commercial oyster bed populations). The salmon and trout fishes spawn in the tributary streams that flow into the Bay. Commercially important rock fishes are abundant in the rocky (reef) areas of the Bay. Pacific herring spawn in Humboldt Bay, depositing eggs on eel grass beds, algae, and rock, and providing forage for game fish. Surfperch (eight species in the bay) contribute significantly to the sportfishing catch. Another game fish mainly taken from the jetties and rocky areas are the colorful greenlings. English sole, California halibut and starry flounder are common representatives of the flounder family found in Humboldt Bay. An important scavenger in the Bay is the Pacific staghorn sculpin (bullhead) which has a tendency to digest any animal matter. See Appendix 6 for listing of fishes and habitats associated with these fishes in Humboldt Bay.

2.075 The following information is extracted from Boyd, (1975). Fish Species Composition and Feeding Preferences:

2.076 The fish species catch by trawls done under contract by Humboldt State University for the Corps and made in October at 19 stations, was composed predominantly of English sole, speckled sandab, and shiner perch. These three species accounted for 90% of the total catch by numbers of individuals. White perch and walleye perch accounted for 4% of the total catch, with 19 additional species accounting for 6% of the total catch. Sampling was accomplished with 16 and 32-foot otter trawls. This method does not adequately sample the total Bay fish population but does indicate which species make active use of the channel areas.

2.077 Essentially all the English sole in the October trawls were in the 0 year class-group (first year of life). These juveniles were most abundant in the Samoa Channel and northern part of North Bay Channel. Shiner perch also occurred there in highest densities. This species is least abundant toward the mouth of the Bay. Sanddabs were found in greatest numbers in North Bay Channel from Station 12 to Station 19. Other fish species occurred in such low numbers that an accounting of their distribution patterns would be unreliable.

2.078 In November, 1974, trawl samples were again obtained at the 19 cross-channel stations. In these trawls shiner perch replaced English sole as the dominant species, accounting for 47% of the individuals caught. English sole and speckled sanddab accounted for 29% and 12% of the catch, respectively. These three species accounted for 88% of the November catch.

2.079 Diversity estimates of fish species samples from October by the Shannon-Weaver index indicate that benthic fish population diversity is highest in the Eureka and Samoa Channels with lower diversity in trawls from North Bay Channel. High numbers of English sole in the Eureka and Samoa Channels in October may have biased these stations toward higher diversity. By November many of these juveniles may have left the upper bay for ocean waters, thus accounting for their lower percent occurrence in trawl samples and higher diversity estimates for samples in the central bay (Eureka and Samoa Channels mean fish population diversity = 1.0866, standard deviation 0.2332; North Bay Channel mean fish population diversity = 1.2965, standard deviation 0.2432).

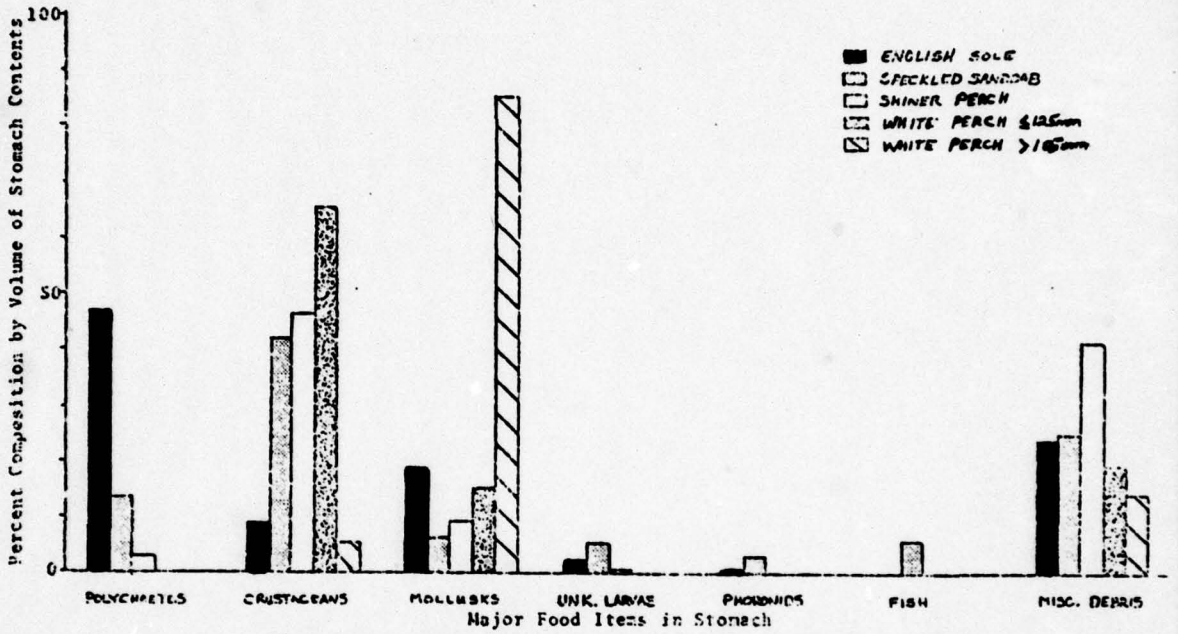
2.080 Food preference studies were concentrated mainly on English sole, speckled sandabs, shiner perch, and white perch because of their numerical abundance in the trawl samples, and because of their commercial and sport fishing importance. Juvenile English sole in the Samoa and mid-North Bay Channels fed primarily on benthic polychaetes, while infaunal molluscs and epifaunal crustaceans were a significant part of the diet of juveniles in Eureka Channel and Entrance Bay (Plate 16). It is apparent that these benthic grounds are highly significant food producing areas for English sole juveniles.

2.081 White perch from the trawl samples had been feeding primarily on infaunal clams and secondarily on crustaceans. Larger individuals of this species (>125 mm length) appear to feed heavily on molluscs, while smaller individuals (< 125 mm length) concentrate on crustaceans (Plate 15).

2.082 The remaining two dominant species, shiner perch and speckled sanddab, feed primarily on crustaceans, secondarily on molluscs and rarely on polychaetes (Plates 15 and 16).

J. Avian Resources.

2.083 Humboldt Bay is a major wintering area for over 100 species of migratory water birds and the adjacent shorelines provide habitats for many additional land and semi-aquatic species. Humboldt Bay boasts three species of loons, five kinds of grebes, twenty varieties of ducks, three kinds of cormorants, pelicans, three species of geese, black brant, ten types of gulls, terns, and seabirds. The Bay supports this large variety of bird life primarily due to the broad selection of food organisms including snails, clams, clam worms, fish, and other marine organisms. The Bay eelgrass is a source of food for brants and ducks while it also offers a resting area for other birds.



THE PERCENT COMPOSITION BY VOLUME OF STOMACH CONTENTS OF THE FOUR MOST ABUNDANT FISH SPECIES TRAWLED FROM HUMBOLDT BAY.

ENVIRONMENTAL STATEMENT	
HUMBOLDT COUNTY	CALIFORNIA
HUMBOLDT HARBOR & BAY	
STOMACH CONTENTS OF ABUNDANT FISHES	
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E	
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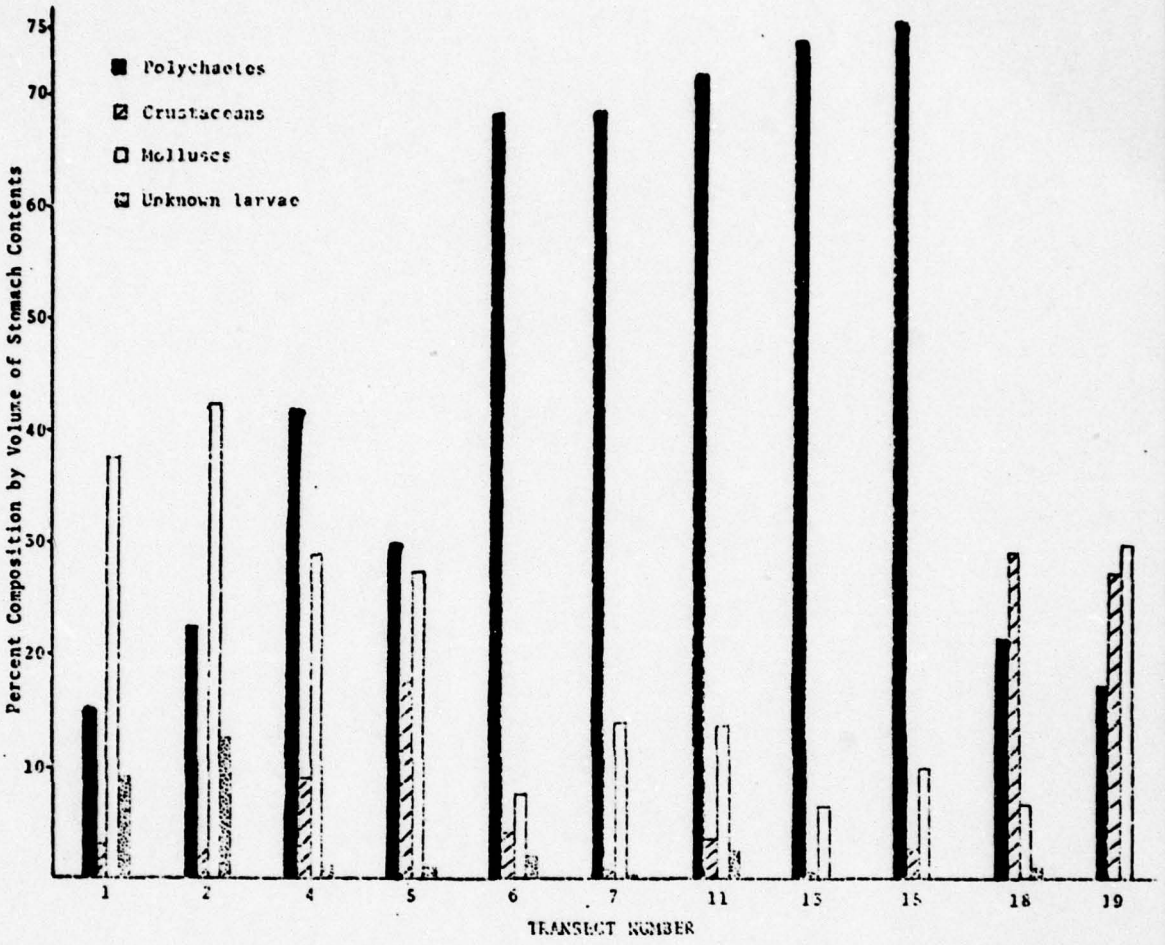
PLATE 15



The percent composition by volume of stomach contents of English sole trawled from Humboldt Bay.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

STOMACH CONTENTS OF ENGLISH SOLE

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
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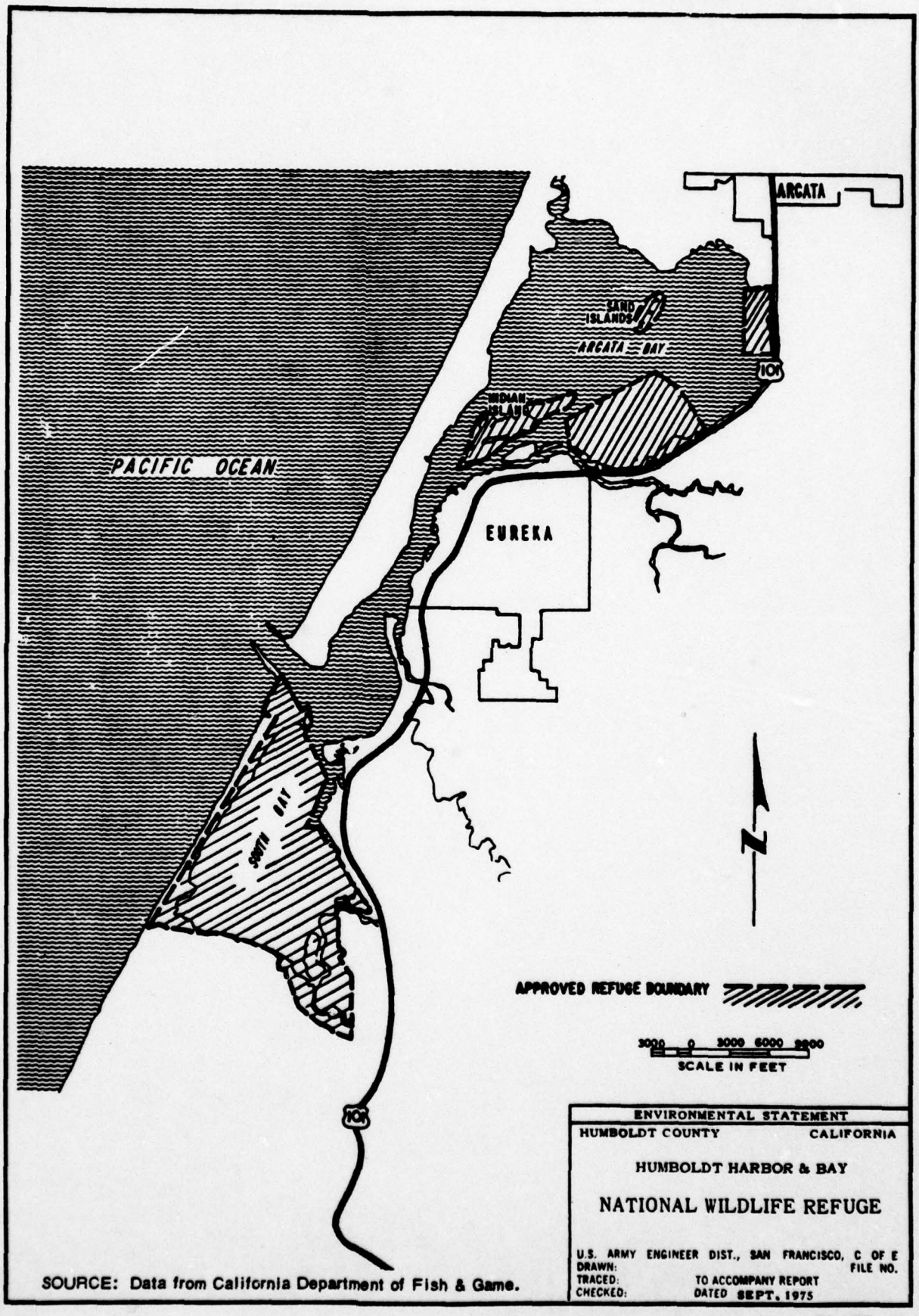
CHECKED: DATED

PLATE 16



SOURCE: Data from California Department of Fish & Game.

PLATE 17

2.084 The Monterey Cypress grove on Indian Island in the Bay supports a population of American Egret, and populations of blackcrowned night herons and great blue herons. Caspian terns use the unnamed island in North Bay for nesting habitat. The rock jetties at the entrance of the Bay provide special feeding and resting areas for wandering tattlers, rock sandpipers, and surf birds. The historic ruins of the Arcata Wharf provide nesting habitat for more than 200 pairs of doublecrested cormorants. A correlation of bird species and locational designations by season and numerical status is displayed in Appendix 8.

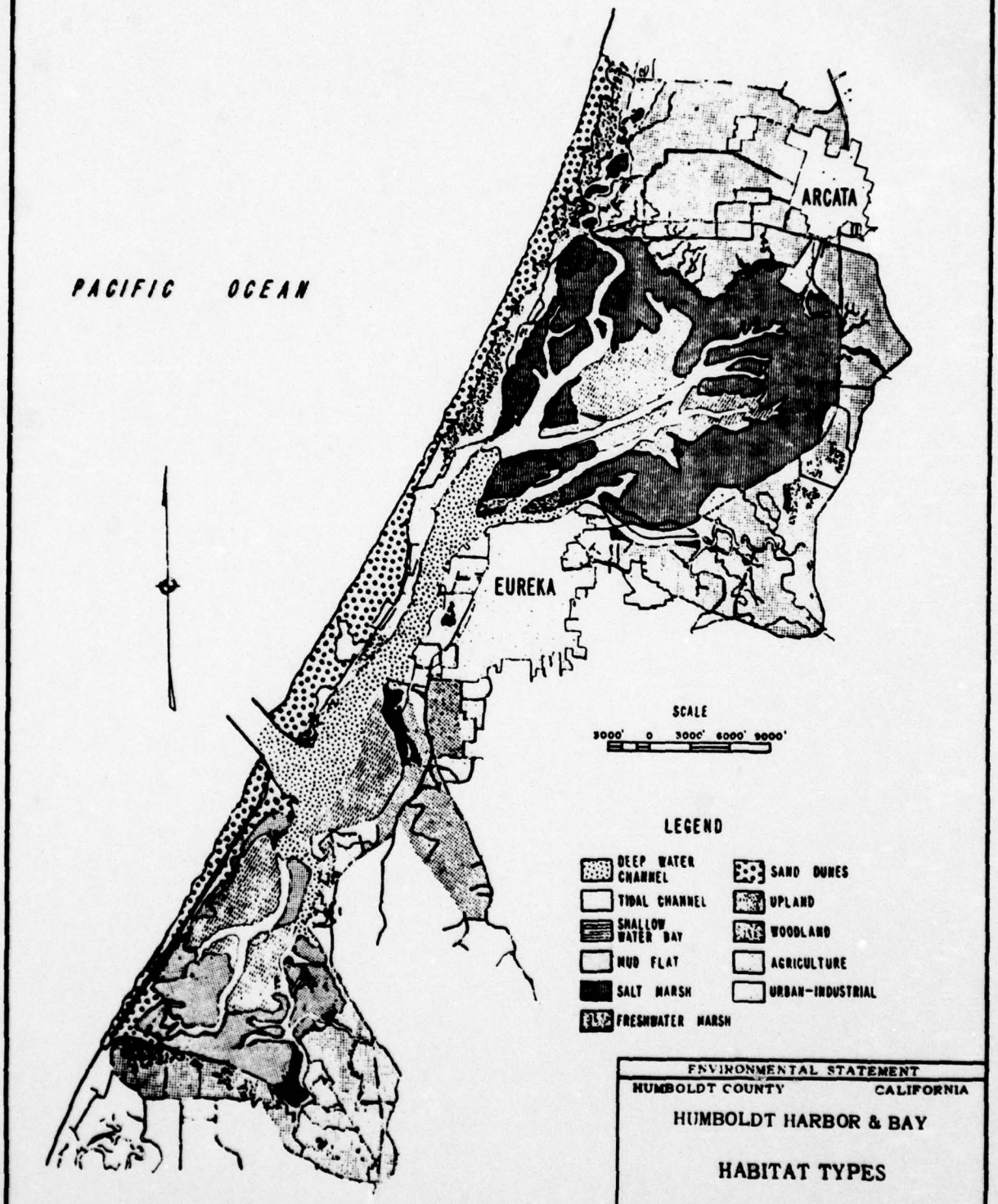
K. Other Biological Resources.

2.085 The Bay water area actually contains eight different wildlife habitats: Open water areas; eelgrass beds; mudflats; pickleweed saltgrass flats; true salt marsh; sand beaches; manmade structures; and brush or tree patches on shorelines and islands. Within Mid-Humboldt County there are eight animal habitat types on a more general scale. These habitat areas and representative mammals, amphibians and reptiles are identified in Appendix 7, and Plate 18. Each of these provides various species of wildlife with suitable food, resting or escape cover, a place to nest, or all three.

2.086 In September 1971, the proposed Humboldt Bay National Wildlife Refuge was approved by the Migratory Bird Conservation Commission. The money for the purchasing of land will come from Migratory Bird Hunting Stamp Funds. A refuge manager has been appointed. The manager will plan for providing recreation use and services for the public including hunting, fishing, nature study, birding, outdoor education, and other associated public benefits. The approved boundaries are shown on Plate 17.

2.087 Rare/Endangered Species: There are no known rare or endangered mammals, reptiles or amphibians in the project area, but the following birds of the area are considered endangered by both the U.S. Department of the Interior and the California Resources Agency: The clapper rail, not seen in the area since 1966; the peregrine falcon, of which two have been seen in three years of recent census taking; and the California brown pelican which does not breed in the area but which does visit there. The southern bald eagle, considered endangered by the Interior Department and rare by the Resources Agency, also occurs in the area.

2.088 Three species of vascular plants, Cordylanthus maritimus (Pt. Reyes bird beak), Montropa uniflora (Indian pipe) and Orthocarpus castillejoides (Humboldt orthocarpus) are listed in the Inventory of Rare and Endangered Vascular Plants of California as occurring in the area of the Eureka quadrangle map. This map covers the north spit, the channels and part of Arcata Bay. None of these plants however, occur on the coastal strand.



SOURCE: Data from California Department of Fish & Game.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

HABITAT TYPES

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

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CHECKED: DATED SEPT. 1975

PLATE 18

2.089 A fourth species, Erysimum menziesii (Menzie's Wallflower) is not listed as occurring in the area of the Eureka quadrangle map, but is shown graphically to occur there on the California Native Plant Societies microfilm of the quadrangles. The director of the herbarium at Humboldt State Unviersity has confirmed the existence of this species, considered to be rare and endangered by the California Native Plant Society, on the sand dunes of the North Spit. More information on the species is presented in Chapter 5-D, paragraphs 5.006-5.011.

L. Tidal Range and Wave Action.

2.090 The tidal range between mean lower low water and mean higher high water is 6.4 feet at the south jetty and 6.7 feet at Eureka. Tides more than two feet below mean lower low water have been recorded. The high tide of 1885 inundated Indian Island and the lower parts of 1st, 2nd, 3rd, and 4th Streets all the way up to D Street in Eureka. The entrance channel is exposed to high waves generated by local coastal storms accompanied by high winds, and to high waves or swell produced by distant offshore Pacific Ocean storms. Both types of waves generally occur during the period from November through April with the critical area of approach being from southwest through northwest. Available data indicate that waves in excess of 30 feet in height occur annually. When such storms occur, wave action makes the channel impassable.

2.091 The predominant direction of littoral drift in the area is from north to south. The Humboldt jetties act as complete littoral barriers. The littoral transport processes cease at the north jetty until enough transport material accumulates to extend the shoreline seaward and littoral drift material can move out around the barrier. When this happens, the littoral transport processes form a sand bar off the tip of the jetties and material moves inside the entrance channel, often building up on the south side of the north jetty.

2.092 When the jetties are battered and partially destroyed by severe storms, the littoral drift barrier is reduced and material can then move through the jetties. (This particular problem should not occur any more due to placement of dolos on the jetties). On the other hand, when the littoral drift is impeded, an eroding action occurs on the south side of the south jetty and drift material from the Eel River and southwesterly littoral forces replace that which is lost. The erosion losses would be significant if not for some littoral movement in a northerly direction (during the winter), and movement of material out around the ends of the jetties and back in along the south jetty.

2.093 One of the features of the jetties when they were first established was a maintenance-free entrance channel due to the funneling action of the ebb tide and the resultant scouring. However, shoaling occurs in the channel from flood tides and littoral transport. Historic wave and weather damage indicate that the least costly alternative for maintenance is through dredging of the channel to allow a deep-enough entrance for waterborne commerce.

2 094 M. Economics - Without Project Conditions: Economic Base. Humboldt County encompasses 3,573 square miles of beaches, dense forests, rich agricultural land, and impressive mountains. Located along the California Coast about halfway between San Francisco and Portland, Ore., it has a climate typical of the North Coast--moderate temperatures and high humidity with little change through the year. The major transportation routes into the area are Highway 101, running north and south, and Highway 299, an east-west route through the Trinity Mountains. There is an airport which provides runways for jets owned by Air West, as well as for numerous small aircraft. The Northwestern Pacific Railroad Co. serves the County as do 15 trucking companies and three buslines. Humboldt Bay provides port facilities to a large fishing fleet, freighters, and several shipping lines with scheduled berth service. Historically, Humboldt County has been a lumbering area with scattered logging operations. Fishing has also played an important economic role, though far less significant than the lumber industry. Agriculture--especially dairying--has been a major employer, but its importance has declined. The beaches, giant redwoods, and promise of a rural character have drawn many tourists to the County. Services to tourists have come to account for an increasingly large part of the employment in the County.

(1) Employment.

2.095 (a) Employment is always a key to population change and in Humboldt County, lumber is the key to employment. In the 1940's and 1950's lumber operations were at full capacity in the area with about 350 mills working to supply the demand generated by the housing boom throughout the nation. In the mid-1950's the boom slowed down, automated procedures were introduced, and prices fell. The small lumberman was forced out of business; the large operations continued to function, but they continuously employed more machines and fewer people.

2.096 (b) Table II-2 indicates the changes in employment that have occurred between 1950 and 1970. Over the 20-year period, the size of the civilian labor force has increased by 47% while the number of unemployed has grown by 164%. Employment in agriculture, construction, and manufacturing has declined--though they remain the largest employers--while employment in food processing and dairy plants has increased and employment in other manufacturing such as pulp mills has also increased.

2.097 (c) The transportation, communications and utilities industry has employed an increasing number of people over the 20-year period, as has the trade industry (both retail and wholesale), finance, and services. The largest increase has occurred in government employment--primarily employment at California State University, Humboldt; employment in this sector of the economy increased 414%.

2.098 (d) By 1960, unemployment in Humboldt County had reached approximately 8%, while the national average was only 5.6%. Throughout the past decade this unemployment rate has never gone below 7% and at times (1967) was as high as 10.8%. Humboldt County's unemployment is both seasonal and cyclical. Data for the 12-year period from 1960-71 indicate that the unemployment rates fall during the summer and autumn months and rise during the winter. An analysis of cyclicality presented in the Humboldt Economic Almanac indicates "very close cyclical correspondence. Total employment, wages, and taxable transactions move together with no difference in timing of more than one quarter and with no consistent lead or lag pattern." (Groby and Ehlen, 1971).

(2) Population.

2.099 (a) In 1930, Humboldt County had a population of 43,233. By 1970, the population had more than doubled to 99,692, according to the April 1970 census. Much of the increase occurred in the 1940's and 1950's when decennial population figures recorded changes of more than 50% (Table II-3). During the last 10 years, the population of the county has declined by 5%. It is estimated that the natural increase in population during the decade was 10,900 while the net out-migration was 16,100. (California Department of Finance, 1971).

2.100 (b) Humboldt County is one of the few areas of California where, in spite of the rapid growth of the state as a whole, the population has experienced a recent decline. Out-migration resulted largely from severe cutbacks in employment in the lumber industry. Since 1968 there has been a slow increase in population (less than 1% per year) (ibid), as the lumber industry is tending to approach stabilization and as tourism is slowly reaching more significant proportions.

Table II-2

EMPLOYMENT IN HUMBOLDT COUNTY - 1950-1970

	1950	1960	1970
Civilian Labor Force	27,909	39,158	41,100
Employed	26,431	36,215	37,200
Agriculture	2,505	1,907	1,800
Construction	1,784	1,990	1,200
Manufacturing	9,799	12,842	9,600
Food (dairies and fish processing)	(482)	(827)	(900)
Lumber	(8,726)	(11,150)	(8,200)
Other (primarily pulp)	(591)	(865)	(500)
Transportation, Communications, and Utilities	1,693	2,144	2,200
Trade	4,726	6,650	7,000
Finance	512	834	1,000
Services	3,531	5,061	6,200
Government	1,536	3,249	7,900
Other	345	1,538	300
Unemployed	1,478	2,943	3,900

Source: Daniel, et.al. 1970.

Table II-3

HUMBOLDT COUNTY POPULATION - 1930-1970

Year	Population	Percent Change During Decade
1930	43,233	-
1940	45,812	6.0%
1950	69,214	51.1%
1960	104,892	51.5%
1970	99,692	-5.0%

Source: Groby and Ehlen, 1971.

(3) Income.

2.101 (a) Real per capita personal income (adjusted for inflation) in the county increased by 2.2% per year from 1960 to 1968. In 1960, personal income per capita was $2,274 in Humboldt County, $2,710 in California, and $2,215 nationwide. In 1968, the county's per capita personal income had risen to $3,095, compared with $4,012 for California, and $3,412 for the United States. Clearly, the economic position of Humboldt County relative to both the state and the nation as a whole has deteriorated (Table II-4).

Table II-4

PER CAPITA INCOME
HUMBOLDT COUNTY, CALIFORNIA, AND UNITED STATES
(Current Dollars)

	1960	1968	Percent Increase Per Year Adjusted for Inflation
Humboldt County	$2,274	$3,095	2.2%
California	2,710	4,012	2.8%
United States	2,215	3,412	3.1%

Source: California Department of Finance, 1971.

2.102 (b) As employment opportunities have undergone a relative shift out of the lumber industry into other industries over the past 15, and particularly the past 10 years, there have been related changes in wages and other income. Generally, the absolute decline in population from 1960 to 1970 can be attributed primarily to a decline in employment opportunities in the lumber industry. Through a multiplier effect, the population decline, compounded by high interest rates, has caused a decline in both seasonal and annual employment in contract construction, particularly since 1965.

2.103 (c) During the same period there has been an absolute and relative increase in employment in services, wholesale and retail trade, finance, government, and manufacturing other than lumber and lumber related industries. This shift has contributed to the relatively slow growth in total wages and per capita personal income. Most of the sectors in which opportunities are growing appear to have lower wage rates than those sectors which are declining or stable.

2.104 (d) The construction of two new pulp mills in 1965 contributed to a stabilization in employment. As per capita personal income rises, albeit slowly, increases in the proportion of total employment in services and trade are also contributing to a reduction in seasonal unemployment. However, the growing tourist related sectors (also services and trade) compound the seasonality in other export-base industries. As a result unemployment and unemployment claims have been increasing during the off-peak seasons even though total employment has been increasing. If seasonal instability is to be reduced, growth in employment opportunities in industries having more stable levels of activity will have to be sought, such as in manufacturing other than lumber. Diversification into alternative economic opportunities, and hopefully into higher income-producing opportunities, will be necessary to improve economic conditions for residents. Special emphasis must be placed on increasing jobs for those presently unemployed or underemployed due to seasonal reductions in economic activity.

(4) Commercial Shipping in Humboldt Harbor.

2.105 (a) Humboldt Harbor has served as the major port on the northern California coast for the past 100 years. Historically, forest products have been the most significant commodities in the Bay's waterborne commerce. These products currently include logs, wood pulp, wood chips, staves, mouldings, lumber, plywood, veneers and miscellaneous wood products. As shown in Table II-5, lumber products and wood pulp have accounted for an average of approximately two-thirds of waterborne commerce from 1964 to 1974. The only other significant commodities are chemicals (primarily sodium hydroxide and chlorine for use in pulp processing) and petroleum products (gasoline and fuel oil).

2.106 (b) The demand for logs has fluctuated over the past ten years, with 1968 being a peak year. Japan has been the primary source of demand for logs; however, export quotas have limited the tonnage shipped. In addition, the rising price of logs in the United States and a slowdown of construction activity in Japan have also limited export volume.

2.107 (c) Lumber and wood products are shipped primarily to the San Francisco Bay area and southern California ports. Demand for these commodities depends on the level of construction activity. The reduction in the volume of construction activity has prevented a high growth rate in tonnages shipped. The demand for redwood has remained relatively strong and non-cyclical as its uses for interior paneling and exterior siding are not drastically affected by construction trends. Wood chips, previously burned as waste, began to be a significant export product in 1971. Since then, exports have increased from 14,245 tons to 171,840 tons. Japan is the principle customer for the wood chips and

utilizes them for paper production. A continued growth in exports is anticipated. Exporting of wood pulp was begun on a large scale in 1965 with the opening of Louisiana-Pacific's pulp mill. Wood pulp is the largest single forest product in the Bay's waterborne commerce, and both domestic and international demand are expected to continue to grow at a high rate.

2.108 (d) Refined petroleum products are imported to serve the local population and industry. These products include gasoline and fuel oils, and are essential to the local economy. Bulk transportation by water is the most efficient method of shipment, and is expected to increase in proportion to the local population and economic growth. Chemical products are the third largest commodity category and are imported from domestic sources to serve the wood pulp industry. As can be seen in Table II-5, the volume of imports has followed the growth pattern of pulp exports. The remaining commodity flows include a small number of miscellaneous commodities whose volumes fluctuate from year to year, and which may be one-time shipments or receipts. Internal traffic consists of fish and shellfish; rafted log traffic ended in 1970.

2.109 (e) Total traffic of major cargo vessels and barges is shown in Table II-6. The number of vessels calling at Humboldt Harbor is generally proportional to the volume of total waterborne commerce. This relationship is expected to remain relatively stable unless significant improvements are made to enable much larger ships to enter the Bay. The proposed improvements to the entrance and internal channels are designed to permit ships with a draft of approximately 30 feet. This will permit an increase in the size of ships using the harbor. However, it will not enable the largest container ships or supertankers to enter the harbor.

(5) Future Economic Growth Sectors.

2.110 (a) The economy of the County has stabilized somewhat since the dramatic decline in the lumber industry during the 1960s. However, there are no indications yet of any substantial growth in new industries. Prospects for future growth in employment and total income to the county must center primarily on "export-base" industries which can make up for the past decline and prospective stability of the major export industry of the past--the lumber industry. Potential is centered on the wood products (pulp and paper) industry, services to tourists, food processing, agriculture, light manufacturing and State and Federal Government expenditures. Growth in these industries, which bring "outside" income into the county, would indirectly stimulate further expansion of the local services economy as resident business and household incomes increased.

TABLE II-5

WATERBORNE COMMERCE

HUMBOLDT BAY
(In thousands of short tons)

Commodity	1966	1967	1968	1969	1970	1971	1972	1973	1974
Foreign Export									
Lumber products	212	340	841(a)	601	495	380	307	616	655
Pulp	50	98	117	158	251	170(c)	248	311	328
Other	0	2	2	2	0	1	0	1	0
Foreign Imports									
Miscellaneous	0	0	0	0	0	0	19(b)	43(e)	11(f)
Coastwide Shipments									
Lumber products	39	26	35	28	25	16	19	-	-
Miscellaneous	0	1	5	7	0	2	3	-	-
Coastwide Receipts									
Chemicals	46	77	114	107	110	107	121	96	85
Petroleum products	256	260	293	296	306	319	345	347	309
Miscellaneous	99	0	74	61	18	106(d)	0	5	0
Internal									
Rafted logs	177	207	223	397	444	0	0	0	0
Fish	9	11	12	13	16	12	13	13	9
Total Traffic	890	1,023	1,716	1,670	1,664	1,114	1,074	1,432	1,397

Source: Waterborne Commerce Part IV, Army Corps of Engineers

Notes: (a) 1968 Foreign exports: Large increase to 841 wholly due to log shipments.
(b) 1972 Foreign imports: 18,623 tons of crude petroleum.
(c) 1971 Exports reduced because of dock strike.
(d) Sand, gravel and crushed rock for entrance jetty repair.
(e) 1973 Foreign imports: 43,109 tons of crude petroleum.
(f) 1974 Foreign imports: 11,040 tons of pulp.

2.111 (b) Diversification of the economy has been occurring very slowly. This is due to the absence of major resources to attract new industries, lack of diversity of skills in the labor force, distance from major markets, and the absence of major tourist attractions. Tourism clearly offers one of the few significant opportunities at present for increasing the rate of economic growth. However, it may not be a source of substantially higher incomes per household and per capita.

2.112 (c) The most recent addition to the attraction of the area to tourists has been the Redwood National Park in northern Humboldt and Del Norte Counties. Increases in total visits, since establishment of the park, have been modest. However, it is too early to predict accurately the impact of this facility on tourism in the county.

Table II-6

TOTAL TRAFFIC

BY TYPE OF VESSEL

	Self Propelled		Non-Selfpropelled		
Year	Dry Cargo	Tanker	Dry Cargo	Tanker	Total
1966	126	24	91	54	295
1967	180	24	18	78	300
1968	256	30	60	91	437
1969	206	25	65	102	398
1970	204	29	39	89	361
1971	119	31	56	87	296
1972	145	31	28	90	294
1973	174	32	35	75	316
1974	127	33	20	111	291

Source: (U.S. Army Corps of Engineers) Waterborne Commerce.

N. Utilities.

2.113 The Pacific Gas and Electric Company operates a nuclear power plant 4 miles south of Eureka on the east bank opposite the entrance to Humboldt Bay. Radioactivity released in air, water and solid waste effluents from the plant are summarized in Table II-7. These releases were only a small fraction of the permissible limits set forth in applicable regulations and in the technical specifications for the plant.

2.114 The Lawerence Livermore Laboratory in Livermore, California has analyzed the radioactivity of the sediments in Humboldt Bay, and has found essentially no nucleides other than 137-Cs which is at world background levels. Studies of radioactivity in the man-made channel leading from the plant indicated that almost all of the waterborne radiation is trapped on silt in this canal. Based on these studies, the Corps will not analyze its sediment samples for radioactivity, and no radiation related problems are expected from the land disposal of the sediment.

Table II-7

Facility Summary:

Utility Pacific Gas & Electric Company Facility Humboldt Bay 3

Type Boiling Water Reactor Docket No. 50-133 Licensed Power Level 240 MWT

Gross Thermal (MWHT) 1.5×10^6 Net Electrical (MWHE) 4.2×10^5

Gross Electrical (MWHE) 4.4×10^5 Reactor Availability 89.2%

Location 4 Mi. S. Eureka, California Cooling Water/Dilution Source Humboldt Bay

Airborne (curies)		Liquid (curies)		Solid Waste (curies)	
A) Total Noble Gases	3.5×10^5	A) Total MF&AP	2.4	A) Volume (M^3)	88.3
B) Total I-131	0.17	B) Total Tritium	51.3	B) Activity (Ci)	17.6
C) Total Halogens	0.87	C) Dissolved Noble Gases	--	C) Number of Shipments	34
D) Total Particulates	0.12	D) Volume of Liquid Waste	1.92×10^6(L)		
E) Total Tritium	1.9	E) Volume of Dilution Water	1.7×10^{11}(L)		

Source: U.S. Nuclear Regulatory Commission, 1975.

O. Historical and Archaeological Resources.

2.115 The Humboldt Bay Area is rich in archaeological resources. This is due to the use of the area by Wiyot and pre-Wiyot Indian cultures for fishing and shellfish gathering. However, the shifting sand dune topography and the development associated with the city of Eureka has buried or obliterated most surface traces of the remaining sites.

2.116 Prior to the completion of the working paper, a thorough literature search and combination intuitive reconnaissance (detailed inspection of selected areas of probable occupation) and general surface survey (on-foot inspection of all land surfaces visable without major modification of vegetation and structural cover) of the originally selected dredged material disposal sites were undertaken for the Corps under contract with Mr. Gary Berg, Archaeologist for Environmental Research Consultants (ERC) Inc. Berg (1974). Of the five disposal sites initially surveyed, two have been subsequently recommended as the principal disposal locations (sites 13B and 13C of Plate 23) for the project. A subsequent reconnaissance of the two preferred disposal sites consisting primarily of a detailed general surface survey was completed by Mr. Rick Anuskiewicz, District Archaeologist for the Corps in July 1975 to augment the initial survey of the two sites to insure accuracy of field data.

2.117 The two archaeological reconnaissances covering the recommended disposal sites have indicated that there are no archaeological sites at or near the proposed disposal locations. The ocean disposal site was not surveyed but since it is located in 65-78 feet of water, the possibility of impacting submerged cultural resources is considered highly remote. An expensive survey of this site would not be in the public interest.

2.118 Although none are located on or near the proposed disposal areas, seventeen archaeological sites do exist in the Bay area, and are reported in the ERC report and its addendum. Sixteen of these sites were originally reported by Loud (1918) and one was discovered during the Corps sponsored survey. These sites are listed as CA-Hum-14, 15, 16, 17, 18, 19, 20, 21, 65, 69, 70, 71, 73, 76, 77, 79 and the new unnamed, worked Chert site where a Chert knife was found. Eight of these sites are located on the east side of the Bayshore, three on the Coast Guard Property and six on the western shoreline of the bay. For all of these sites except the worked Chert site, little if any evidence of the site remains on the surface. Filling, wind erosion, extreme bayshore erosion and heavy industrial development have largely obliterated any trace of these sites.

P. Population.

2.119 (a) Introduction. A discussion of the population in the Humboldt Bay Area is included to give an idea of the social well-being of the people that inhabit the area. The discussion that follows includes the historical and projected population trends, the density and spatial distribution of the inhabitants, the composition of the population, and social status that they have achieved.

2.120 (b) Number of Inhabitants. The Humboldt Bay Area 1/ had a population of 57,538 persons according to the U.S. Census of 1970. The number of inhabitants for selected areas enumerated in the 1970 Census are shown in Table II-8. This table also shows the 1975 population estimates for the same areas according to the California Department of Finance.

Table II-8

NUMBER OF INHABITANTS

AREA	1970 CENSUS 4/	1975 ESTIMATE 2/	% CHANGE
California	19,967,304	21,030,155	+ 5
Humboldt County	99,692	104,200	+ 4
Humboldt Bay Area 3/	57,538	N/A	---
Eureka	24,337	24,500	+ 0.6
Arcata	8,985	11,650	+30

1/ The Humboldt Bay Area is defined as including the Census County Divisions Arcata, Eureka, and Eureka Southeast.
2/ California Department of Finance, 1975.
3/ Includes Census County Divisions Arcata, Eureka, and Eureka Southeast.
4/ U.S. Department of Commerce, 1972.

2.121 (c) Historical Population Trends. Between 1940 and 1960 the population in Humboldt County increased at about the same rate as the State, but in the decade 1960 to 1970, Humboldt County experienced a loss in population while the rest of California continued to grow. This was due to the major setback in the lumbering business that occurred in the late 1960's. This trend has reversed somewhat since the period

1970 - 1975 shows a growth rate of 4% for the County as compared with the 5% growth rate for the State for the same period. Historical population trends for selected areas are shown in Table II-9. The continued growth of the city of Arcata is due in part to the growth of Humboldt State University and the annexation of unincorporated lands surrounding the city.

TABLE II-9

HISTORICAL POPULATION TRENDS

YEAR	CALIFORNIA	HUMBOLDT COUNTY	HUMBOLDT BAY AREA	EUREKA	ARCATA
1940	6,907,387	45,812	N/A	17,055	1,855
% Change	+53	+51	N/A	+35	+101
1950	10,586,223	69,241	N/A	23,058	3,720
% Change	+49	+51	N/A	+22	+41
1960	15,717,204	104,892	57,868	28,137	5,235
% Change	+27	-5	N/C	-14	+72
1970	19,953,134	99,692	57,538	24,337	8,985
% Change	+5	+4	N/A	+1	+30
1975*	21,030,155	104,200	N/A	24,500	11,650

Source: U.S. Department of Commerce, 1971.
* Estimates by the California Department of Finance, 1975.
N/A = Not Available

2.122 (d) Population Projections. In 1974, the California Department of Finance published population projections for California and Humboldt County as shown in Table II-10. The projections indicate that the growth in Humboldt County will continue, but at a rate that is lower than that of the State.

TABLE II-10

POPULATION PROJECTIONS - 1975-2000

YEAR	CALIFORNIA	HUMBOLDT COUNTY
1975	21,030,155	104,200
% Change	+12	+5
1980	23,549,000	109,000
% Change	+20	+11
1990	28,188,000	121,000
% Change	+16	+11
2000	32,567,000	134,600

2.123 (e) Spatial Distribution of the Population. Due to the topography of Humboldt County, the major concentration of economic activity is found around Humboldt Bay which accounts for the fact that approximately half of the county's population is located in that area. The cities of Eureka and Arcata are the major population centers but there are also a number of small unincorporated communities scattered around the bay.

2.124 (f) Composition of the Population. A summary of data pertaining to the composition of the population for selected areas is presented in Table II-11. The data presented in the table reveal that the population in the study area is relatively young, includes a high percentage of males, and has a low percentage of minorities.

TABLE II-11

COMPOSITION OF POPULATION

CHARACTERISTIC	CALIFORNIA	HUMBOLDT COUNTY	HUMBOLDT BAY AREA	EUREKA	ARCATA
Population, Total	19,957,304	99,692	57,538	24,337	8,985
In Percent	100	100	100	100	100
SEX CHARACTERISTIC					
Male	48	51	50	49	53
Female	52	49	50	51	47
ETHNIC CHARACTERISTICS					
White	89	96	97	96	98
Black	7	0.4	0.5	1	0
Others	4	4	3	3	2
AGE CHARACTERISTICS					
Under 18 Years	33	34	36	30	27
18-64 Years	57	57	57	58	67
65 Years and Over	9	9	7	12	6
Median Age	28.0	26.9	N/A	30.3	23.5
HOUSEHOLD CHARACTERISTICS					
Persons in Households(%)	93	97	98	98	88
Persons per Household	2.95	2.97	2.90	2.67	2.90

Source: U.S. Department of Commerce, 1972.

2.125 (g) Educational Achievement. The level of educational achievement in the Humboldt Bay Area is somewhat lower than that of the State as a whole. In 1970, there were 55% high school graduates in Humboldt County and 60% in Eureka as compared with 62% for the State.

The higher level of educational achievement for Arcata, 21% college graduates as compared with 13% for the State, is due to the location of the Humboldt State University in the City of Arcata. Table II-12 presents the data on educational achievement.

TABLE II-12

EDUCATIONAL ACHIEVEMENT

EDUCATION	CALIFORNIA	HUMBOLDT COUNTY	EUREKA	ARCATA
Persons 25 Years Old and Over	10,875,983	26,348	6,716	3,729
In Percent	100	100	100	100
Years of School Completed:				
No Years Completed	2	1	0.4	1
1 to 4 Years	3	2	2	3
5 to 7 Years	7	7	6	5
8 Years	9	15	13	10
9 to 11 Years	18	20	19	17
12 Years	33	30	33	24
13 to 15 Years	16	13	15	18
16 Years and More	13	11	12	21
Median Years Completed	12.4	12.2	12.3	12.6
Percent High School Graduates	62	55	60	63

Source: U.S. Department of Commerce, 1972.

2.126 (h) Types of Employment. The data presented in Table II-13 reveal that a high percentage (10%) of the work force in the Humboldt Bay Area and in Humboldt County are classified as, laborers other than farm-laborers, which compares with 4% for the State as a whole. This is a reflection of the importance of the lumber industry in the economic activity in the Humboldt Bay Area.

TABLE II-13

TYPES OF EMPLOYMENT

OCCUPATION	CALIFORNIA	HUMBOLDT COUNTY	EUREKA	ARCATA
Employed Persons 16 Years Old and Older	7,484,690	33,563	8,739	3,223
In Percent	100	100	100	100
Professional, Technical	17	13	13	19
Managers, Administrators	9	9	11	8
Sales	8	6	9	7
Clerical and Kindred	20	15	18	19
Craftsmen and Foremen	13	14	12	10
Operatives excl. Transport	10	11	9	9
Transport Workers	3	5	4	4
Laborers excl. Farm	4	10	7	10
Farmers and Farm Managers	1	1	0.1	0.4
Farm Laborers	2	1	0.5	0.4
Service Workers	11	12	14	13
Private Household Workers	1	2	2	1

Source: U.S. Department of Commerce, 1972.

2.127 (i) Family Income. The 1970 Census data for family income and income distribution for selected areas are summarized in Table II-14. The median income for the Humboldt Bay Area appears to be substantially less than that for the State since the median incomes for Humboldt County ($9,154), Eureka ($9,108), and Arcata ($10,141), are substantially lower than the median income for the State ($10,732). In addition, a higher percentage of families in the Humboldt Bay Area, Eureka, and Arcata have incomes below the poverty level than in the State as a whole.

TABLE II-14

FAMILY INCOME IN 1969

CHARACTERISTIC	CALIFORNIA	HUMBOLDT COUNTY	EUREKA	ARCATA
All Families	5,001,255	25,623	6,424	1,842
In Percent	100	100	100	100
Earning				
Less than $1,000	2	2	3	2
$1,000 to $1,999	2	3	4	3
$2,000 to $2,999	4	4	4	4
$3,000 to $3,999	4	5	6	6
$4,000 to $4,999	4	5	6	6
$5,000 to $5,999	5	6	6	3
$6,000 to $6,999	5	6	6	6
$7,000 to $7,999	6	8	7	7
$8,000 to $8,999	6	9	8	6
$9,000 to $9,999	6	8	7	8
$10,000 to $11,999	13	14	12	15
$12,000 to $14,999	15	13	12	15
$15,000 to $24,999	21	14	14	16
$25,000 to $49,999	5	3	4	6
$50,000 and more	1	1	1	0.3
Median Income	$10,732	$9,154	$9,108	$10,141
Mean Income	$12,227	$10,335	$10,614	$11,140
Percent of Families Below Poverty Status	8	10	11	10

Source: U.S. Department of Commerce, 1972.

Q. Recreation.

2.128 One of the major recreational regions in California is the northwestern portion of the State, where Humboldt County is located. Recreational areas within the region include ocean beaches, coastal lagoons and estuaries, freeflowing undeveloped streams, inland wilderness areas and lakes, developed parks and recreational areas, and the nationally famous redwoods including the Redwoods National Park and Humboldt Redwoods State Park.

2.129 The recreational opportunities available in the Humboldt Bay Area are associated with the unique natural resources of the area. The ocean and the ocean beaches provide opportunities for driftwood gathering, fishing of various types, skin diving, surfing, camping, picnicking, and places for nature studies and the enjoyment of scenery. The lagoons and estuaries attract waterfowl hunters, fishermen, boaters, and nature lovers. Humboldt Bay itself provides opportunities for fishing of various kinds, pleasure boating, hunting for waterfowl, and nature studies.

2.130 A multitude of recreational facilities such as state and county parks as well as undeveloped areas are available on land around Humboldt Bay. Recreational opportunities found in such areas include camping, picnicking, fishing, hunting, boating, canoeing, swimming, waterskiing, and the enjoyment of nature in general.

R. History of the Humboldt Bay Area.

2.131 Indians of the Wiyot linguistic group inhabited the Humboldt Bay Bay Area when the first explorers arrived in the Bay in 1806. It is not known how long the Wiyots had inhabited the area, but based on archaeological evidence, they had lived there a considerable time. The first written records of these inhabitants are the records of the first explorers that entered the Humboldt Bay Area in 1806.

2.132 Spanish explorers were the first Europeans to sail along the coastline of present day Humboldt County but they failed to discover Humboldt Bay. Cape Mendocino was reached by Cabrillo and Ferrelo in 1542 and by Vizcaino in 1602 and 1603. Juan Francisco de la Bodega y Cuadra and Bruno de Heceta in 1775 explored and charted the coastline of Humboldt County and claimed the land for the King of Spain. In 1793, Captain George Vancouver in the service of King George III of England explored the coastline to determine the Spanish influence over the area.

2.133 Humboldt Bay eluded discovery until 1806 when Jonathan Winship sailed the ship O'Cain into the Bay. He named the bay, "Bay of Indians" due to the large number of Indians that lived around the bay.

2.134 Following the discovery of Humboldt Bay in 1806, no attempts were made to settle the area. Fur traders probably visited the bay on many occasions but there are no records to verify such visits.

2.135 In 1849, the Bay was rediscovered when Josiah Gregg with a party passed through the area overland. The name Humboldt Bay was given to the Bay by Lieutenant Douglass Ottinger who in 1850 entered the Bay aboard the ship Laura Virginia.

2.136 The discovery of gold in the Trinity Mountains in 1849 gave tne impetus to settle the Humboldt Bay Area as a supply base for the miners to avoid the lengthy and difficult supply route along the Sonoma Trail or through the Sacramento Valley.

2.137 In 1850, four settlements were established on the shores of Humboldt Bay, namely Humboldt City, Arcata, Eureka, and Bucksport.

2.138 Humboldt City was the first settlement in the area, founded in April 1850. The Laura Virginia Company surveyed and located a settlement right opposite the entrance to the Bay. It was named Humboldt City but then it was abandoned in 1852 because it lost out in the competition with the other settlements.

2.139 Present day Arcata originated as a settlement called Union Town or Union. It was settled by the Union Company from San Francisco and it gained a locational advantage because it was closer to the gold mines in the Trinity and Klamath Mountains than any of the other settlements. Consequently it became the center of trade with the mining districts and gained economic supremacy until 1856, when the lumber industry surpassed mining as the primary factor in the economic activity. This loss of economic importance was caused by the extensive mudflats that separated Union from the navigable waters of the Bay. A long wharf was built across the mudflats to reach deep water but that was not sufficient for Union to retain its position.

2.140 Eureka, because of its locational disadvantage vis-a-vis Union, had quite a struggle during the first years of its existence. However, as the economic activity gradually changed from mining to lumbering, Eureka because of its location on deep water became the center for the lumber mills and it therefore gained in importance. As the lumber industry surpassed mining, Eureka became the most important settlement on the Bay. In 1856, the county seat was changed from Union to Eureka.

2.141 Bucksport was founded by David A. Buck on the shore of Humboldt Bay between Eureka and Humboldt City. For the first few years of its existence, Bucksport competed successfully with the other settlements around the bay. Fort Humboldt was established in Bucksport in 1853 and the soldiers of the fort contributed substantially to the economy of the settlement, but the growth of Eureka overshadowed that of Bucksport so eventually it was incorporated and became part of Eureka.

2.142 In 1851, hostilities broke out with the Indians due to the pressure put on the Indian population by the influx of settlers in the area and the disregard shown the Indians particularly by the miners. As a result of these hostilities, Fort Humboldt was established in Bucksport

(present day Eureka) and soldiers were stationed there to protect the population and maintain the peace. However, skirmishes with the Indians continued for over a decade. Due to the Indian trouble in the area, the rate of growth was slowed somewhat.

2.143 The economic activity in the Humboldt Bay Area was originally dominated by the mining industry but as transportation became less difficult in the region, lumbering increased in importance. In order to compete better on the domestic and world markets, the nine largest lumber mills in the area combined to form the Humboldt Lumber Manufacturing Company in 1854. The lumber industry has been the dominant factor in the economy since 1856. The growth of the area has to a large degree been determined by the vitality and the development of the lumber industry. Eureka and the whole Humboldt Bay Area grew as the lumber industry expanded. Since the lumber industry was dependent upon shipping for the transportation of its products it became necessary to improve the facilities for shipping in order to compete successfully. To facilitate shipping and to allow larger ships to enter Humboldt Bay and to reach Eureka, the U.S. Army Corps of Engineers in 1881 started to dredge and maintain the shipping channels in the Bay. This maintenance dredging is an ongoing process that still continues.

2.144 From its origin, the Humboldt Bay Area was dependent on shipping for the transportation of almost all goods to and from the area. In 1914, however, the area became part of the Northwestern Pacific Railroad system and in the 1920's the Redwood Highway (U.S. 101) reached Eureka. With land transportation available, shipping of goods other than lumber and bulky items declined considerably.

2.145 The increase in tourism in recent years has modified the dependence of the area on the lumber industry, but lumbering is still the dominant factor in the economy of the area.

3.000 RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

3.001 Implementation of the proposed project does not appear to be in conflict with any land use plans adopted by local or county agencies.

3.002 Policies presented in the California Coastal Plan regard dredging as a coastally dependent activity, but placement of dredged materials is not regarded as such. The North Coast Commission would prefer offshore disposal but recognizes that this would add a considerable cost to the project. The North Coast Region Summary of the Coastal Plan recommends that the State give immediate priority to acquiring an open space easement across the North Spit Dunes to prevent future development. The dunes are not listed in the Recommended Coastal Properties for Public Acquisition. Comments by the North Coastal Commission may be found in section 9.00, along with the Corps' responses.

3.003 The recommended action does conform with the recommendations and land use plans outlined in the Humboldt Bay Master Plan (see Plate 19) and in the Humboldt County General Plan 2020. The disposal areas are located entirely within the area designated as Industry-Non-water related, on the Master Plan.

ARCATA

SOURCE: Humboldt Bay Harbor Recreation and Conse

SOURCE: Humboldt Bay Harbor Recreation and Conservation District.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR AND BAY

HUMBOLDT BAY MASTER PLAN

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C. OF E. FILE NO.

TO ACCOMPANY REPORT DATED SEPT. 1975

PLATE 19

3

4.005 More details on the impacts of turbidity may be found in Chapter 5.00.

4.006 b. Chemical Impacts: As described in Section 2-c, extensive sediment sampling of Humboldt Bay has been conducted. With the exception of three samples analyzed for Kjeldahl nitrogen at 2D-1 and 2D-2 and one sample for suspended solids at 2D-11, (see Plate 3 for locations), none of the samples tested exceed applicable pollution criteria set by the Environmental Protection Agency. These samples are located at the extreme northern end of the Eureka Channel and in the Fields Landing Channel, and are thus out of the project area.

4.007 Because of the low levels of pollutants in the sands and limited areas of silt and clay, no negative impacts from low oxygen, heavy metals, excess nutrients or pesticides are expected to be encountered.

2. Impacts On The Sediment-Water Interface:

4.008 a. Impacts on Benthos. An extensive and diverse number of benthic animals live in and near the channels to be dredged (see Appendices 3 and 4). The removal of channel bottom 400 feet wide and 5 feet deep for the length of the channels will destroy the animals living there. An estimate of the amount of biomass removed during the project can be made from the data in Appendix 5. Seventy-five percent of the animals are bivalve shellfish.

4.009 Because the benthos to be dredged are in the channels, they are seldom used by man. Trawl nets are prohibited in the Bay and the commercial oystering activities occur in the shallower waters of the North and South Bays. Some shellfish may be taken by sport fishermen and skin divers, but most prefer the easier access to shallower waters in the North and South Bays and adjacent to the channel. The benthos do however, provide food for finfish and other forms of life.

4.010 b. Impacts on Fishes. Boyd (1975) concluded that benthic infaunal organisms form an important part of the diet of juvenile English Sole (see Plate 16), at least during the autumn. While the data does not indicate the importance of benthos as food for adult fish, nor the relative importance of shallow water areas as feeding grounds for juvenile sole, it is clear that the loss of benthos will reduce the food supply available to the young of this commercially important species. However, in the areas to be dredged, the channel width is usually only 20-40% of the Bay width, (50% in the 3,700-foot section of Eureka Channel). Thus considerable benthos will remain in the Central Bay for fish to feed on, and the entire North and South Bays will also be available in an undisturbed state.

4.011 c. Recovery - As seen in Table II - 1, the North Bay Channel is dredged almost annually. In spite of this, there exists a healthy benthic fauna in the channel, indicating a rather rapid (1-6 months) recolonization of the area after dredging. Other studies have also shown this to be true.

4.012 Slotta et al. (1973) noted that in Coos Bay the total faunal abundance returned to pre-dredging levels in 14-28 days. Taylor (undated) estimated that in Mobile Bay, Alabama, recovery in terms of numbers in a channel area took less than 6 months. Post dredging studies conducted by the Corps of Engineers in the San Francisco Main Ship Channel (at the Bar) indicated that recovery occurred within 2-4 months. The Bar study also noted an increase in the number of species and number of organisms during the recovery period (U.S. Army Engineer District, San Francisco, 1974).

4.013 Though repopulation appears to be very rapid in dredged channels, recovery in terms of the reestablishment of a community similar to that which inhabited the area prior to dredging may take considerably longer than just a few months. Observations in Mobile Bay showed that areas influenced by dredging do not generally return to what may be considered a normal condition for a period of at least two years. The studies at Moss Landing (unpublished) noted that even after 1-1/2 years the recolonized harbor area was completely different, in terms of species number, composition, number of individuals, species diversity, evenness and trophic dominance.

4.014 The diversity and biomass of benthos in the project areas are not distinctly related to water depth, but are related to the size and type of sediment. This is controlled by erosional forces (Boyd, 1975). Because of this, there is not always a distinct difference in numbers and kinds of organisms at the bottom of the channel versus at the edges of the Bay. There are however, differences in type and amount of benthos in the silt, the sand and the coarse sand and gravel. Therefore the creation of a deeper channel will not necessarily result in a different benthic community, but if a different type of substrate is exposed, the new community which develops will be different from the original community.

4.015 The fact that a benthic community which is different from that in non-dredged areas may exist in the channel for several years is not necessarily environmentally detrimental. The increased regional diversity resulting from the existence of differing communities side-by-side may be considered to be beneficial.

3. Impacts on Entire Bay System.

4.016 a. Background. There have been few studies designed to characterize the chemical and physical properties of Humboldt Bay waters. Information concerning some of the important factors such as dissolved

oxygen, temperature and salinity has been gathered incidental to other studies and these data are few, scattered and difficult to relate to an overall characterization. Exceptions include extensive temperature data collected by the Coast Oyster Company at various oyster bed locations and the extensive oceanographic survey of the bay conducted by the Humboldt State University Department of Oceanography in 1961-62 (Skeesick, 1963). Because of the systematic manner in which the data were collected, the results of the Humboldt State University study represent the best characterization of salinity, temperature and dissolved oxygen of bay waters available at this time (California Fish and Game, 1973).

4.017 The survey, conducted between September, 1961, and September, 1962, revealed that natural characteristics of water in the bay are quite variable, undergoing changes in both time and space. The pattern of the qualitative characteristics analyzed indicated that they were affected by three independent variables: (1) climatic conditions; (2) distance from the entrance channel, and (3) quality of ocean water entering the Bay.

4.018 The distribution of salinity in Humboldt Bay varies with the season, with the distance from the entrance channel, and with the quality of the water entering on the incoming tide. In general, relatively high salinities approaching open sea water conditions (maximum of 34.27 parts per thousand (ppt)) occur during the summer and fall months with lower (minimum 28.35 ppt), more variable salinities occurring during the winter and spring, the latter values being influenced by dilution of storm runoff waters (California Fish and Game, 1973).

4.019 It is known from data collected by a Humboldt State University Oceanography Class that a well developed two-layer estuarine system (with a layer of denser sea water below an upper, fresher layer) exists in the Eureka Channel for at least part of the year during periods of high rainfall. This would be expected since the sediments contain 10-50% silt or clay and the channel carries only about 1/3 of the tidal volume of Arcata Bay, indicating a low current velocity. Tidal velocities in the Samoa Channel are greater, resulting in less fine grained material in the channel. It is not known however, if a two-layered system develops in the Samoa or North Bay Channels, but the probability of this occurring greatly decreases as one moves toward the mouth of the Bay because of the swift and turbulent tidal currents and heavy wave action. The existence of a two-layered system means that salinity intrusion from the deeper channel may have more of an impact.

4.020 b. Tidal Prism and Salinity. The deepening of the channels by five feet will result in a larger tidal prism for the Bay. This increase in volume would be made up almost entirely of sea water since it is at the bottom and in direct contact with the sea. The increase in volume would be slight relative to the overall capacity of the Bay, but may result in small increases in salinity in the North Bay. Without an extremely extensive data bank and a mathematical or physical

model of the Bay, the extent of this impact cannot be predicted. However, it is not expected to create any deleterious effects. Beittel (1975) has collected data which indicates that the waters of Arcata Bay and the North Humboldt Channel are not well mixed by each tide. Hence, the increased volume of channel water would push further into Arcata Bay, subjecting a larger area and more organisms to cooler, more saline water. The water in the deeper channels will probably also be cooler and more saline, since present data indicates that channel waters do not mix with the shallower waters.

4.021 c. Bottom Substrate. (From Boyd, 1975): A previous study of sediment distribution in the North Bay and Samoa Channels showed that sediments in the dredged parts of the channels were consistently enriched in gravel relative to the undredged parts and usually contained a somewhat increased component of silt and clay (Thompson, 1971). The enrichment in gravel was attributed to the exposure, by dredging, of older, gravel-bearing deposits which are known to underlie the floor of Samoa Channel near Gunther Island. The higher mud content was attributed to overdeepening the channels below their equilibrium depth such that, subsequent to dredging, a limited amount of silt and clay could accumulate. If these interpretations are correct, and if the stratigraphy of recent deposits beneath North Bay Channel is similar to that beneath Samoa Channel, one may anticipate that renewed dredging will have the effect of increasing the gravel concentration in North Bay and Samoa Channels and, initially at least, reducing the percentage of silt and clay. In Eureka Channel, the principal effect would be to alter the present mud floor to one of sand due to exposure of underlying sand deposits.

4.022 Information gathered in the present study indicates that those channel areas which are floored by relatively coarse sediments are generally the most sterile in terms of infaunal benthic organisms, hence the effect of dredging would be to reduce the amount of suitable habitat for these forms. On the other hand, it is possible that further dredging may overdeepen the channels to the point where significant silt and clay can accumulate and thus enhance the substrate for rehabilitation.

4.023 It is unknown how long a time period would be required to deposit enough sediment in the newly dredged channel for recolonization by a silt-clay benthos community to occur. Boyd (1975) estimated that the areas would remain sandy, or be silted in to a depth of 25 cm in 4-12 years for the Eureka Channel or possibly as long as 120 years for the Samoa Channel.

4. Impacts on Archaeological and Historical Resources.

4.024 In compliance with Section 106 of the National Historic Preservation Act of 1966 (16 USC 470 (f)) the most recent listing of the National Register of Historic Places (Federal Register, February 1976 with monthly supplements) has been consulted and determination has been made that no National Register property is affected by the project. In

compliance with Executive Order 11593 of 13 May 1971, the State Historic Preservation Officer was sent a copy of the working paper for his comments and determination that no State Historic Landmarks or State Points of Interest would be affected by the project. In addition, a copy of the draft environmental statement was forewarded to the Resources Agency of California for review and solicitation of comments from its various component departments (i.e. Department of Parks and Recreation). No comments were received from the State Historic Preservation Officer relating to either the draft environmental statement or working paper, so it is assumed that the project is in compliance with Executive Order 11593.

4.025 There is always the question as to whether there will be an impact on submerged cultural resources by the deepening and widening of channels and turning basins. This is possible, but improbable. The potentially impacted submerged areas within the channels and basins have been subjected to maintenance dredging by the Corps on a regular basis (Table II-1). Shoals located in the Fields Landing Channel and bar and entrance channel have been dredged on a semi-annual basis. Shoals in the North Bay Channel have been dredged at least once every three years, while shoals in Eureka Channel have not required maintenance dredging since 1970. The Samoa Channel is practically maintenance free, due to scouring tidal action. The Corps initiated exploratory sampling of the proposed project and adjacent areas in May of 1971, June and July of 1974 and in May 1975 in an effort to establish channel bottom composition profiles. Borings executed at depths varying from 1 to 23 feet below the existing channel bottom indicate that the Humboldt Bay bottom consists primarily of loose to dense sands with an occasional trace of silt, fine gravel and some shell fragments. In the northern reaches of Eureka and Samoa Channels, the bottoms were underlain by soft clay. Deposition is believed to have occurred as a result of local tidal action. Given the composition of the channel bottoms, the frequency and extent of disturbance due to maintenance dredging, the constant deposition of sediments and the horizontal fluctuation due to cyclical tidal velocities; it is unlikely that the cultural resources, if located, would have any significant diagnostic or scientific value. There is a strong possibility that the matrix would simply not yield a suitable environment for associative analysis due to the above factors. Individual artifacts, if encountered, could be analyzed, however their diagnostic value as unassociated cultural elements would be significantly reduced. Since it does not appear likely that cultural resources exist within the proposed dredging area, no subsurface testing or monitoring of the dredging activities appears necessary at this time. The Corps recognizes the potential necessity for further underwater cultural surveys should the dredge material indicate that submerged cultural resources exist.

5. Impact on Regional Economy and Transportation.

a. With Project Conditions - Construction Period:

Income, Employment or Labor Force Generated by Dredging.

4.026 (1) In dredging the North Harbor, hydraulic dredges using 16-inch pipe would be utilized. In their operations such dredges would require about 35,000 feet of 16-inch pipe and several booster pumps. Besides the dredges, a barge, tugboat and shore crew would be needed, as shown below:

Dredge Crew	6 Men
Barge Crew	2 Men
Anchor Barge Crew	2 Men
Tugboat Crew	5 Men
Shore Crew	3 Men
Total	18 Men

This operation includes both the dredging and the dredged material disposal, handling about 110,000 cubic yards per month. The average costs for a month's operation are estimated below:

Rental	$32,598
Operation	88,802
Labor	76,052
Total Monthly Cost	$121,760

There are about 2,210,000 cubic yards to be dredged. Thus, the project would take about 20 months (2.2 million divided by 110,000).

4.027 (2) Of the total dredging cost of $4.1 million, about $1.6 million would be spent for labor, $1.9 million for operation, and $680,000 for rental of equipment. The equipment would all be rented from outside of Eureka, probably from the San Francisco Bay Area. Similarly, the labor would most likely come from outside Eureka since the jobs require skilled or specialized workers. Of the total cost of dredging, only the operations portion and labor would be spent in the Humboldt area. The operations component includes fuel and other costs of running the plant and equipment (excluding labor). Fuel would be purchased from local sources in Humboldt County. Thus, over 50 percent of the total operation cost of about $1.9 million would be spent in the local Humboldt economy over a period of about 20 months. The laborers would live near their work for about 20 months and thus would spend at least part of the $1.9 million in the Humboldt Bay area. This would be spent locally on food, health, housing, entertainment and other services. However, a certain portion would be saved or spent outside the Humboldt area, but this is likely to be less than 50% of the total.

4.028 (3) Besides jobs and income related directly to the dredging program, there are secondary or indirect jobs and incomes created by the direct impacts. When the direct incomes are spent locally, this in turn creates secondary impacts in terms of jobs, payrolls or income. The direct plus the indirect impacts equal the total impact. In many economic impact studies, the relationship between the direct impact and the total impact is expressed as a "multiplier," a number which when multiplied by the direct impact from a given source will indicate the total impact induced by that source. Such multipliers are by nature only rough estimates. Other studies of the North Coast of California have estimated a multiplier for Humboldt Bay of about 2.6 (U.S. Army Engineer District, 1972). This implies that if the entire $1.9 million of operating cost is spent locally, the total impact would be about 2.6 times $1.9 million or approximately $4.9 million. However, this total of $4.9 million of direct plus indirect impact would be spread over 21 months. Thus, the impact would be about $233,000 per month or $2.8 million per year. At the end of the dredging project, the impact would disappear.

Public Facilities and Services.

4.029 (1) During construction of a project, the labor force engaged in the dredging would have to be housed and education provided for any children involved. Discussion with county government officials indicates that no public housing would be needed. Rather, the private housing market would be able to handle the needs of the workers involved. Indeed, only about 18 workers may be brought into the area. Moreover, discussion with industry spokesmen (of dredging companies) indicates that any workers hired from outside Eureka would stay only for a maximum of 21 months and therefore would be less likely to bring dependents into the area. Hence there would be little or no pressure placed on the public schools or other child-related services.

Tax Revenue and Property Values.

4.030 (1) Local and county governments receive revenue from retail sales and use taxes, local property taxes, and city business, license or franchise taxes. The sales tax is levied against retail sales of tangible personal property, while the property taxes are levied against real and personal property.

4.031 (2) During construction of a project, about $3.5 million would be spent for labor and operations over a period of about 21 months. This study previously estimated that about $2.6 million would be spent locally for petroleum products, housing, food, clothes and other items. If this amount is spent on retail sales of tangible personal property, 6% of the $2.6 million (or about $156,000) would be collected by the State of California as a sales tax. Of this tax, 1% or

about $16,000 would be returned through a subvention to a local taxing jurisdiction. In this case, the local taxing jurisdiction would most likely be the incorporated cities of Eureka and Arcata. In addition, another 1/4% would be returned to the County (or about $4,000). The 1% returned to local taxing jurisdictions can be used for any purpose, while the 1/4% returned to the county must be used for public transportation. Moreover, historically the State of California has spent a large proportion of the 4-3/4% kept by the State for public education. This is returned to local school systems on the basis of educational needs.

4.032 (3) Because the construction period would only extend over a period of about 21 months, there would be little or no effect on property values before the project is completed. After project completion, there may be some increase in property values as a result of some increased business activity. Business and industrial activity is discussed in 4.a. below. However, given the difficulty of estimating increased business or industrial activity, the estimation of any increased property values is virtually impossible.

With Project Conditions - Post-construction Period.

4.033 a. Business and industrial activity related to dredging after the project is completed.

4.034 (1) Presently, only ships with a draft of about 26 feet or more experience tidal delays when using Humboldt Bay Harbor. The proposed project would accommodate ships with a draft of approximately 30 feet. Thus, the dredging would permit an increase in the size of the ships using the harbor, although it would not enable the largest container ships or supertankers to enter the harbor.

4.035 (2) Besides permitting larger ships to use the harbor, the project would reduce the transportation costs of the existing vessel traffic. In part, this would be due to the elimination of tidal delays in the North Bay. Under current conditions, vessels drawing 26 feet or more encounter delays in the North Bay Channels. Since vessels are now being built with deeper and deeper drafts, more and more vessels will be affected in the future. This will result in somewhat less cargo passing through Eureka than would be the case with deeper channels.

4.036 (3) Beside the above losses, other business could be affected because some vessels may be routed to other harbors unless there are deeper channels. In particular, this may happen with shipments of redwood products. Without deeper channels, vessels may be rerouted to San Francisco and lumber may be trucked out of Eureka. Thus, by raising the costs of transportation, some business would be lost at Humboldt Harbor.

4.037 (4) Forest products historically have been the most significant commodities in Humboldt Bay's waterborne commerce, as discussed in 2-M. Given the projected increases in the demand for certain forest products, and given a trend toward the use of deeper draft vessels, the economy of Humboldt County could be adversely affected unless deeper channels were provided. This is because products would either be transported into or out of Humboldt at a higher cost or would not be transported at all.

4.038 (5) Unfortunately, losses of income or employment to the labor force of Humboldt County are difficult to determine. Because truck or rail transport might be substituted for ocean shipping, there may be little direct loss of employment or income in Humboldt County. On the other hand, fewer wood chips or less wood pulp may be exported without the availability of 35-foot deep channels. In this case, the job and income losses would be difficult to estimate.

Local and/or Regional Growth.

4.039 (1) As discussed in 4.a. above, losses of income or employment due to a failure to dredge channels deeper are difficult to estimate. Such differences in business activity could only be measured on a with and without project basis, holding all other factors the same. Such a controlled experiment is impossible over the same period of time. Thus, reliable estimates of the effect of a dredging project on local and/or regional growth are difficult to obtain.

6. Impacts Related to Geologic Conditions.

4.040 The impacts related to geologic conditions of the project area are: seismicity and ground stability, tsunami potential, and groundwater contamination.

4.041 a. Seismicity and Ground Stability. Humboldt Bay is in an active seismic region and it can be expected that the area will be subjected periodically to shocks of varying intensities. Ground motions initiated from earthquakes could cause liquefaction of some sediments within the project reach and may result in subaqueous landslides along channel slopes and/or differential settlement in adjacent bay bottom areas.

4.042 b. Tsunami Potential. Tsunamis infrequently strike the California coast. Those that have entered Humboldt Bay in the past (the most recent being 1960 and 1964) have caused damage as a result of strong currents rather than inundation of the peripheral areas of the Bay. Recurrence of a similar tsunami could induce strong currents which might change the configuration of channel slopes and contribute sediment to the channel bottoms.

4.043 c. Groundwater. No new avenues for sea water encroachment into fresh water aquifers would be exposed as a result of the proposed dredging in Humboldt Bay. However, the placement of sediments dredged from the Bay onto the north spit would affect the fresh water aquifers contained within the dune sands in several ways. One effect would be the changing of the configuration of natural catchment basins which would alter the distribution pattern and quantity of precipitation infiltrating into the water bodies beneath the disposal areas. The thickness as well as type of material through which recharge water percolates would also be altered with the possible effect being an increase in the amount of dissolved solids entering the groundwater. The use of hydraulic procedures to emplace dredged materials onto the spit would introduce large volumes of highly saline water to the area with the possibility of infiltration of significant amounts of these waters into underlying groundwater bodies. Insufficient data concerning configuration, size, and locations of these groundwater bodies precludes estimating the degree and extent that contamination might occur or for what period of time the effects of such contamination might endure. The impact of such contamination would be minimal in that most of the communities on the peninsula including the Coast Guard installation now utilize imported water for their principal water supply. (See 5.004 for more details on ground water impacts).

7. Miscellaneous Impacts.

4.044 a. Rare and Endangered Species. There are no rare or endangered species which rely directly or extensively on habitat to be affected by the dredging. This consideration plus the fact that the area modified is only a small percentage of the total Bay area make it highly improbable that there would be any measurable impact on rare or endangered species by the dredging.

4.045 b. Health Hazards. Since the sediments to be dredged are not polluted, impacts related to health hazards are not anticipated.

4.046 c. Air Pollution. There would be little or no impact on air quality from the project. The small volume of exhaust from the dredge pumps would be quickly dissipated. There is a slight possibility of local odors at the disposal site but these are expected to be dissipated by daily onshore and offshore winds.

4.047 d. Special Project Features. The creation of the turning basin at the end of the Samoa Channel, the widening of that channel to 400 feet and the widening of the three turns in the North Bay Channel will all have impacts on natural resources similar to those involved in deepening the channels. In these areas, material would be removed from the existing bottom level to a depth of 35 feet rather than from 30 to 35 feet.

4.048 However, the organisms contained in this material are not significantly and/or consistently different from those in the existing channels (Boyd, 1975), nor are they always more or less abundant.

Therefore these areas would provide more material for disposal (including more silt from the turning basin) and more benthos to be destroyed, but will not create any new kinds of biological impact.

4.049 Economic impacts of these features are included with those discussed in 4.024-4.037.

4.050 e. Utility Cables. Deepening of the North Bay Channel may require deeper burial of submarine cables owned by the Pacific Telephone and Pacific Gas and Electric Companies. Further details will be available in the final Environmental Statement.

4.051 f. Items Not Impacted. Dredging would have no impact upon the following environmental indices: noise, displacement of people or farms, community cohesion and public services. Project construction activities are not expected to have a significant effect on property values due to the small labor force involved. Inflation and long-term increases in value of waterfront industrial property due to the project are expected to be more significant. Real increases in values are not readily predictable as they reflect complex economic factors, governmental actions and general economic climate of the region in relation to other ports of California and the nation.

4.052 g. Negative Impacts. Esthetically, the dredging operation would create what will be interpreted by most people as negative impacts. This would result mainly from turbidity in the Bay, and to a lesser extent from the presence of the dredge and long lines of disposal pipe.

4.053 h. Positive Impacts. Moderate growth in business and industrial activity in the project area is predicted on sustained yield of timber resources, fisheries and adequate transportation, particularly water-related facilities and adequate depths for navigation channels to accommodate modern cargo vessels.

4.054 Local and county governments receive revenue from retail sales and use taxes, local property taxes, and city business taxes. The sales tax is levied against retail sales of tangible personal property, while the property taxes are levied against real and personal property. During construction of the project, about $4.8 million will be spent for labor and operations over a period of about two and a half years. It is estimated that about $2.6 million will be spent locally for petroleum products, housing, food, clothes and other items. If this amount is spent on retail sales of tangible personal property, 6 percent of $2.6 million ($156,000) will be collected by the State of California as a sales tax. Of this tax, 1 percent or about $16,000 will be returned through subvention to local taxing jurisdictions. In this case the local taxing jurisdiction will most likely be

the incorporated cities of Eureka and Arcata. In addition, another 1/4 percent will be returned to the county (about $4,000). The one percent returned to local taxing jurisdictions can be used for any purpose, while the 1/4 percent returned to the County must be used for public transportation. Moreover, historically the State of California has spent a large proportion of the 4-3/4 percent kept by the State for public education. This is returned to local school systems on the basis of educational need.

4.055 The following indices are expected to receive small but positive impacts from the project: employment, desirable regional growth, desirable community growth, public facilities and man-made resources. These impacts would result from the deeper channel, money spent during construction and from the increase in port activity that would occur in the years following construction.

4.056 i. Impacts on Maintenance Dredging. With the proposed project changes, the average annual maintenance quantities would increase, but there would not be an increase in the frequency of dredging, since the shoaling rates are generally moderate to slight in the North Bay, Eureka, and Samoa Channels. With the changes, annual maintenance costs would increase by $37,000 to a total of $109,000. The $37,000 increment includes consideration of a 2-foot allowance for overdepth dredging.

B. Impacts of Disposal

4.057 1. Impact on Recommended Sites. The coastal strand community upon which the dredged material will be deposited is dominated by two species of lupine, goldenrod, sand strawberry and sand verbena. A more extensive list of the plant inhabitants is presented in Appendix 2. Although some sections of area 13B are blown-out, barren sand areas, most of the dunes are well vegetated and provide good wildlife habitat for a limited number of animals. Dominant wildlife species include the black tailed deer, several species of mice, blacktailed jackrabbit and California Quail. More details on the composition of the fauna are presented in Appendices 7 and 8.

4.058 Dredged material disposal would result in the loss of habitat and those animals which are resident in the disposal area. Movement away from the site would not avert this mortality since adjacent areas may be presumed to be at carrying capacity and lacking in available food and cover to support the displaced population. Information detailed enough to predict the magnitude of this loss is not available but a reasonably accurate estimation would be several hundred animals, consisting mostly of rodents.

4.059 Several thousand hours of bird observation and other biological investigations have taken place in the vicinity of the airport, both on and adjacent to the disposal sites. During the migratory seasons there have been accidental sitings of eastern warblers in the willow habitat located in the dune swales (Yocom and Harris, 1975). These birds, such as the black and white warbler, normally migrate via the eastern seaboard but occasionally become confused and migrate along the west coast. Their appearance in Humboldt County is transitory and they tend to concentrate in the willow patches which occur in some of the low swales between dunes. Since they are not territorial, the loss of some willow habitat would not preclude using other areas of willows nearby. About 10 species of casual and accidental birds have been sighted in the coastal brushfields which typify the proposed disposal sites (Yocom and Harris, 1975).

4.060 This willow habitat also provides cover and a diversity of plant species for native wildlife. While the disposal sites include several willow patches (the largest of which is about 100 by 20 yards), the main bird observation areas will not be impacted by the disposal. The area of willow habitat not impacted is much larger than the area that will be covered by dredged material.

4.061 The loss of some willow habitat is considered a trade-off which is necessary for the viability of the project, but is not considered to represent total destruction of the ecosystem. Willow and dune habitat will be decreased in the area, but will still be available adjacent to the project site. After several years, the disposal site will slowly begin to revert back to its original state and its value as wildlife habitat will increase.

4.062 Most of the existing vegetation would be destroyed by the dredged material, but islands would remain at the tops of the highest dunes. Re-seeding and natural re-vegetation would create a habitat similar to that which existed before disposal except that there would be flatter areas and shallower depressions to collect rainwater. This would reduce the biological diversity of the area, but would create an area which subsequently could be more easily converted to a site suitable for construction if so desired by the local sponsor. The species re-seeded will be:

Sagebrush	*Artemisia pycnocephala*	3 lbs per acre
Sand Verbena	*Abronia latifolia* or *A. umbellata*	1/2 lb per acre
California Poppy	*Eschscholtzia californica* or *E. maritima*	1 lb per acre
Lupine	*Lupinus arboreus*	1 lb per acre

This re-seeding will be a local responsibility as listed in the local agreement with the Corps and in the Corps plans and specifications.

4.063 Two additional factors will be acting to improve the biological productivity of the newly created disposal area. Before the site is filled, large quantities of vegetation and topsoil will be bulldozed and stockpiled from portions of all areas except the tops of the higher dunes. This material will be spread across the tops of the newly filled site to promote natural re-vegetation. Enough material to cover about 1/3 of each site with a layer several inches deep will be stockpiled. Also, the material dredged from the channel bottoms is expected to be more fertile than the existing dune sand. After the rains leach the salt from the upper layers, and as the site develops a soil structure, this fertility may aid in the re-establishment of vegetation.

4.064 The pipeline carrying the dredged material will be floating where crossing Bay waters and laying on the ground on the spit except for being below ground where crossing the road. Preliminary route and right-of-way surveys have not indicated any problems along the proposed pipeline area. Corps specifications prohibit leaks in the pipeline. Thus with the possible exception of some local disturbance of habitat adjacent to the pipe, there should be no negative impacts on natural resources from conveyance of dredged material. Pumping of the material does, however, require a high energy cost. The contractor in charge of dredging will most likely use electricity to power the dredge pumps.

4.065 2. Impact of Ocean Disposal. Ocean disposal of 190,000 cubic yards of clean sand from the hopper dredge at 1.5 miles from shore in 70 feet of water would not cause any extensive negative impacts. The benthos in the material would probably not survive, and any benthos at the site, with the exception of the mobile forms which can burrow through the newly deposited material, would be smothered. However, recolonization is expected to occur in 4-6 months. Some commercial crabs would be smothered but in the opinion of the Eureka Office of the California Department of Fish and Game, the effects on the overall population will not be noticeable.

4.066 3. Impact of Runoff From the Disposal Areas. The dredged material would be pumped in the form of a slurry containing excess water which would be allowed to drain into the sand at the disposal site. All of the areas being considered for disposal have a high infiltration capacity (see Plates 20 and 21), and there is expected to be only small quantities of run-off. The run-off water will pass through a series of silt trapping baffles and will drain into the ocean.

4.067 The U.S. Soil Conservation Service has described these dune soils as having high infiltration rates even when thoroughly wetted, consisting of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and would result in low run-off potential, according to the SCS. Tidal action and active surf would rapidly dissipate any silt should some still remain after passing through the settling ponds.

4.068 4. Water Quality Standards. Staff coordination with the North Coast Regional Water Quality Control Board indicates the following standards would apply for discharge of effluent from the dredge slurry into Humboldt Bay:

BOD	SUSPENDED SOLIDS	SETTLEABLE SOLIDS
30 day avg. - 30 mg/liter	10 mg/1 - 30 day avg.	0.1 ml/1 - 30 day avg.
Daily Max. - 50 mg/1	20 mg/1 - daily max.	0.2 ml/1 - daily max.

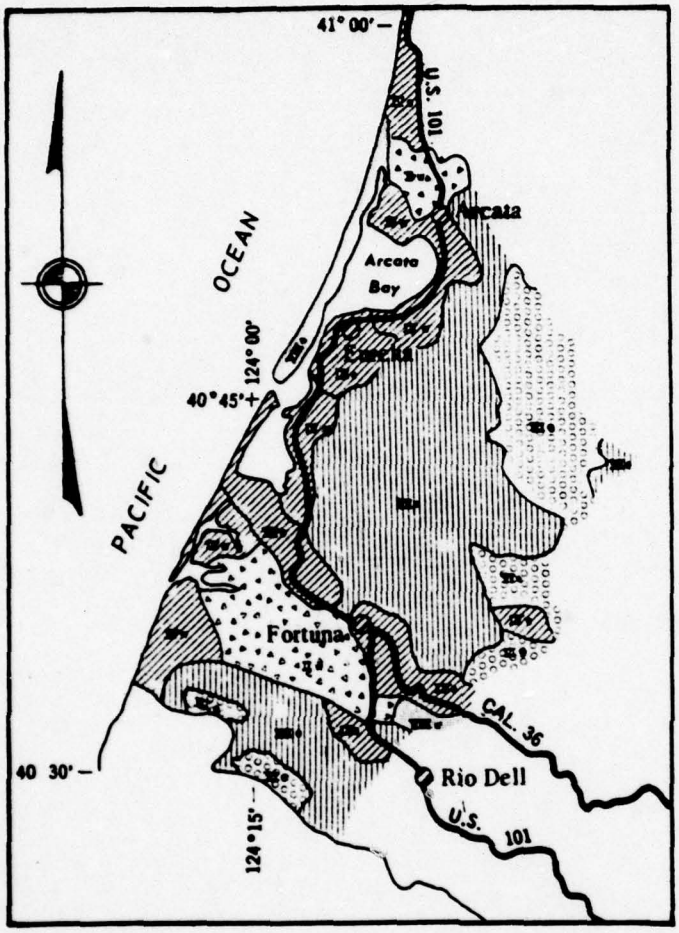
Receiving Water Quality Objectives

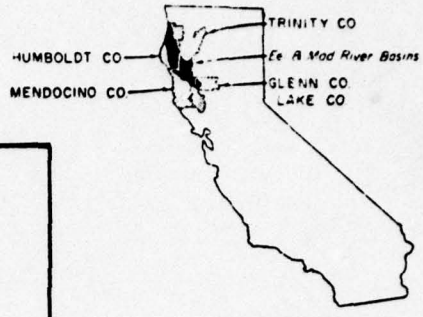
No oxygen sag below 6.0 mg/liter
No pH change more than 0.2
No turbidity increase of more than 20 percent above background.

4.069 On March 25, 1976, the North Coast Region Water Ouality Control Board considered but did not adopt changes in the objectives for turbidity in Humboldt Bay. Since the drainage from the disposal site will be to the ocean, the only possible turbidity problems from dredging would be from the operation of the dredge itself, but these are not expected to be significant (see 4.000-4.005 and 5.001). North Coast RWQB standards for ocean disposal of dredging effluents have not been finalized, but they are generally less stringent for some parameters, such as BOD, than estuary standards. Refer also to 2.017 and Appendices 9-13.

4.070 5. Future Land Use of The Disposal Sites. Various types of future land use have been proposed for the North Spit disposal areas in the past. At present the City of Eureka's plans for an airport industrial park have been discarded; the Humboldt Bay Harbor, Recreation and Conservation District proposes industrial use of the land and the North Coast Regional Commission would like to see the areas used for recreation. At this time, no definite changes are scheduled for the areas. The airport itself must remain an airport or the control of the property will revert back to the Federal Government.

4.071 The Federal Aviation Administration (FAA) requires that structures built near airports not exceed certain heights, depending on the distance from the sides or ends of the runway. At present, approximately seven planes are registered as using the Eureka City Airport and the Coast Guard plans to use the base for its air-sea rescue operations. The FAA has prescribed a 20:1 horizontal:vertical slope limitation for structures built in a specific distance from the runway. The slope limit to the sides of the runway is 7:1. The south end of the runway is at about 9 feet above sea level. The Corps will comply with all applicable FAA regulations, and will notify FAA of its plans and design before construction begins. If necessary, site 13C will be shifted to the west, or the dike elevations will be kept below FAA limits.





LOCATION MAP

LEGEND

CLASS II

Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

CLASS IV

Soils in Class IV have greater limitations and hazards than Class III. Still more difficult to complete treatments are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

Land Limited in Use - Generally not suited for cultivation

CLASS VI

Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland, or wildlife.

CLASS VII

Soils in Class VII have very severe limitations or hazards that make them generally unsuited for cultivation. They are suited to grazing, woodland, or wildlife.

CLASS VIII

Soils and land forms in Class VIII have limitations and hazards that preclude their use for cultivated crops, pasture, range, or woodland. They can be used for recreation, wildlife, or water supply.

Subclasses

e - Erosion hazard. Dominant limitation is the risk of erosion if the plant cover is not maintained.

w - Excess water, drainage, or overflow hazard.

s - Soil. The soils are shallow, droughty, or low in fertility.

NOTE: Only the dominant land capability class and subclass is shown in each delineation.

This map is intended for general planning. Each delineation may contain soils having ratings different from those shown on the map. Use detailed soil maps for operational planning, and on site inspection for more detailed decisions.

5 0 5 10

SCALE IN MILES

January 1968

SOURCE: Data from USDA–SCS, Portland, Oregon.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

GENERAL LAND CAPABILITY MAP

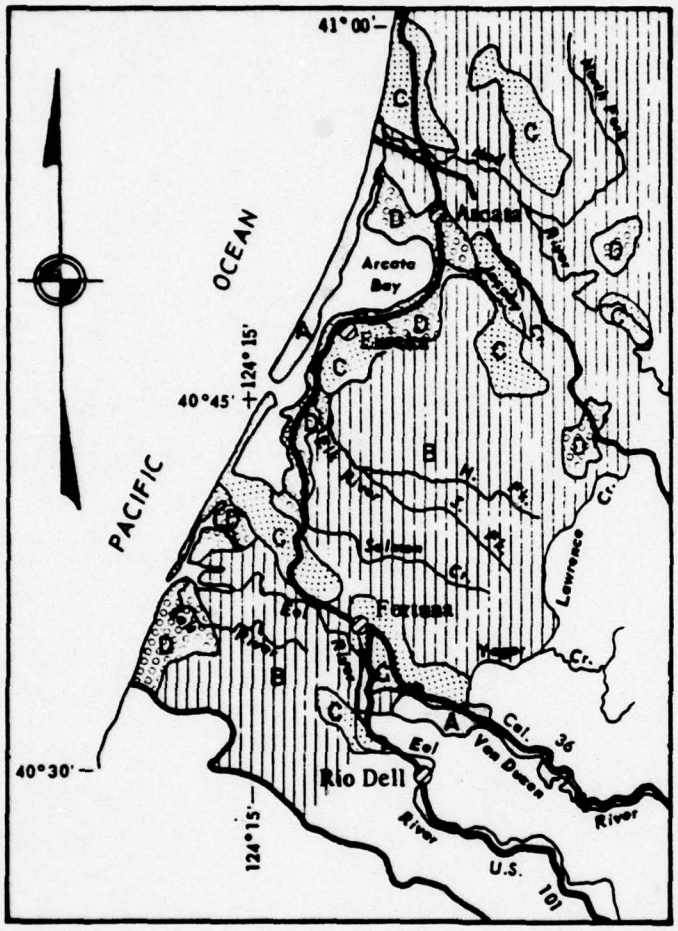
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

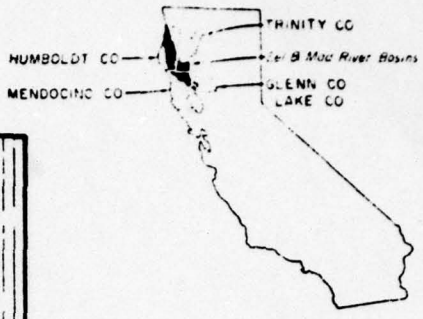
DRAWN: FILE NO.

TRACED: TO ACCOMPANY REPORT

CHECKED: DATED SEPT. 1975

PLATE 20





LOCATION MAP

LEGEND

River Basin Boundary

A

B

C

D

This map is intended for general planning. Each delineation may contain soils having ratings different from those shown on the map. Use detailed soil maps for operational planning, and on site inspection for more detailed decisions.

5 0 5 10

SCALE IN MILES

January 1968

SOURCE: Data from USDA–SCS, Portland, Oregon.

ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

HYDROLOGIC SOIL GROUPS

IN SHEET SHEET NO.

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E

DRAWN: FILE NO.

TRACED: TO ACCOMPANY REPORT

CHECKED: DATED SEPT. 1975

PLATE 21

4.072 Placement of the dredged material on the recommended North Spit disposal sites would have effects on any of the proposed uses of the land. The aesthetic value would be degraded for recreational use. Wildlife would make less use of the site, and future industrial use would be slightly enhanced by the leveling effect of the new material.

4.073 Since detailed site locations for the dikes around the disposal areas are not prepared until funding is authorized for plans and specifications, it cannot be determined at this time if disposal will impact on a National Geodetic Survey marker called "Flag One" which is located 200 feet north of the Coast Guard Boundary Zone. If the marker has to be moved, the Corps will contact Mr. Leo Critchlow of the Pacifica Office of the Geodetic Survey, who is responsible for such actions. Cost of relocation will be at project expense. Survey markers "Sand and Rolph" in the vicinity of the disposal areas have been lost or destroyed. Marker "Bay" was last reported in 1951, was in poor condition and had been moved. No attempt will be made to locate these markers.

4.074 6. Geological Impacts. The geological impacts of disposal are discussed in IV-A-6.

4.075 7. Impacts on Archaeological and Historical Resources. As previously stated, there are no archaeological resources located at or near either of the two recommended land disposal sites. The ocean site has not been surveyed but the existence of cultural resources there is considered remote and there are no plans to survey this site. Thus, the disposal of dredged material as proposed will not negatively impact on any areal cultural resources. In compliance with Section 106 of the National Historic Preservation Act of 1966 (16 USC 470 (f) the most recent listing of the National Register of Historic Places (Federal Register, February 1976 with monthly supplements) has been consulted and a determination has been made that no National Register property is affected by the project. In compliance with Executive Order 11593 of 13 May 1971, a copy of the working paper was forwarded directly to the State Historic Preservation Officer for his comments and determination that no State Historical Landmarks or State Points of Interest would be affected by the project. In addition, a copy of the draft environmental statement was forwarded to the Resources Agency of California for review and solicitation of comments from the various component departments (i.e. Department of Parks and Recreation). No comments were received so it is assumed that the project is in compliance with Executive Order 11593.

4.076 8. Other Impacts Related to Disposal. Disposal of dredged material from this project would not require displacement of people or farming operations. Nor will there be any changes in community cohesion or public services as a result of the proposed disposal.

4.077 With the exception of very localized areas around the dredge and booster pumps, there will be no impacts from noise.

4.078 The distance of houses to the site and the dispersal actions of the sea breezes indicate that there will be no negative impacts on air quality, except that some odors may occasionally eminate from the sites.

4.079 Although the following indices maybe positively impacted by the project (see section 4-A) the disposal operations alone would not have a positive or negative impact on them. These parameters include the following: tax revenues, business and industrial activity, employment and desirable regional growth. The disposal operations would also have no impacts on property values, desirable community growth or man-made resources.

4.080 Aesthetic values and public facilities however, would be negatively impacted by the project. The dunes are presently used for recreation in the form of dune buggy riding, walking, etc. These uses, and the pleasing scenic values of the disposal sites would be temporarily interrupted, and to some extent, permanently modified.

5.000 ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Of the impacts described in Section 4.000, the generation of turbidity, the alteration of benthic habitat and the possible contamination of local shallow wells can be considered to be adverse. All of these impacts would be temporary in nature. The loss of stable dune habitat which supports the plant Erysimum menziesii is also considered an adverse impact.

A. Turbidity.

5.001 At the present time the methods available for the control of dredging generated turbidity (such as the use of silt curtains) are still in an experimental stage, and there are no practical means of avoiding turbidity. However, the hydraulic suction dredge, which would be used for almost all of this project, suspends the least amount of material of the three types of dredges available. In addition, unless the currents are strong the material should not remain in suspension more than 1/4-1 hour, nor should it be concentrated enough to create adverse impacts beyond 100 meters from the dredge. (U.S. Army Engineer District, San Francisco-Dredge Disposal Study-Appendix C, in preparation.) The biological impacts of this turbidity were discussed in Section 4.000.

5.002 In the event that regulatory authorities discover effects of dredging in certain seasons to have a significant adverse effect on spawning runs or other seasonally sensitive wildlife activities, the contract and construction schedule would allow for suspension of operations for up to 60 days in a calendar year.

B. Benthic Habitat.

5.003 Approximately two square miles of benthic habitat would be removed to a depth of five feet. The recovery of benthos in this area as described in Section 4.000 would be somewhat dependent on the spawning cycles of the invertebrates. Most of the species spawn in late spring and summer, and the polychaetes and crustaceans usually produce more than one group of young per year. Those areas dredged just before spawning would be repopulated rapidly while those dredged in the late fall or winter would take longer to recover. Eggs and larvae in the immediate vicinity of dredging operations may be adversely impacted by the turbidity in silty areas.

C. Ground Water Contamination.

5.004 Several houses within 800 feet of the potential disposal sites are still making use of shallow water wells. It has been estimated by a local resident that no more than 16 houses continue to use wells but that 8 of these have not connected to the Humboldt Bay Municipal Water System, and are thus totally dependent on their well. Only

one or two of these houses do not have direct access to a nearby section of the water system. The wells in the area are about 15-20 feet deep and are dependent on surface water percolation.

5.005 About 1-1/2 years ago dredged material from the bay was deposited in an area adjacent to the bay and east of the recommended disposal sites. About 24,000 cubic yards of material were deposited, but no contamination of wells was reported. Because some of the excess water from the Corps disposal project would seep straight down below the immediate site, contamination would probably not occur. However, should the upper layers become saturated during the approximately twenty-one months of disposal, causing salt water to spread out and contaminate wells, those houses impacted would be connected to the water system. The high rainfall in the area is expected to eventually flush the salt from the area, but the time required for this to occur cannot be estimated.

D. Erysimum menziesii.

5.006 Because the listing of rare and endangered plants by the California Native Plant Society does not list Erysimum menziesii (Menzies Wallflower), as occurring in the area represented by the Eureka quadrangle, the draft EIS stated that no rare or endangered vascular plants occurred on the coastal strand. However, Dr. James Smith, director of the herbarium at Humboldt State University (HSU) has informed the Corps that this species does exist on the proposed disposal sites. Field investigations by a Corps ecologist revealed that approximately several hundred plants exist at site 13C and 300-500 at 13B. Numerous plants were also found outside of the disposal areas including the Coast Guard site, west of and north of the airport.

5.007 Munz (1959) states that the species is found on the dunes at Point Pinos, Monterey County, and along the coastal strand from Fort Bragg to north of Humboldt Bay. Mr. Bruce Cowan of Pacific Grove, California has confirmed the existence of established colonies at Point Pinos.

5.008 Erysimum menziesii is a biennial or short-lived perennial with a long taproot and bright yellow flowers. The California Native Plant Society (CNPS) lists the species as: endangered in part, declining in vigor, endemic to California with occurrence confined to several populations.

5.009 A Corps ecologist has inspected the Wallflower specimens at the HSU Herbarium and has coordinated comments on this topic from the Eureka office of the California Department of Fish and Game, the Sacramento and Eureka offices of the U.S. Fish and Wildlife Service and the North Coastal Commission. At present, a listing of threatened plants has not been published by the U.S. Fish and Wildlife Service. However, E. menziesii is expected to be on the threatened list to be published by the Fish and Wildlife Service in 1977. In the 7 June 1976 Federal Register, the Fish and Wildlife Service published proposed language regarding endangered and threatened plants. The proposed language

states that government agencies shall insure that their actions do not jeopardize the continued existence of endangered and threatened species or result in destruction or modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with the affected states, to be critical.

5.010 At the time of preparation of this report, the Corps has been working with the local sponsor and concerned agencies to mitigate for the loss of Erysimum menziesii habitat. Precedent for transplanting individual plants to be impacted by a project exists in the form of a permit granted by the Central Coastal Commission to an applicant who wanted to build a home on a site containing 24 specimens of Erysimum menziesii. The permit was granted contingent upon the applicant hiring a consultant to develop a plan for the protection of the plants. The plants were transplanted and presently are growing well in one-gallon cans, awaiting the completion of construction. The consultant also stated that the specimens could be grown from seed.

5.011 With regard to the Humboldt Project, the following mitigation will be accomplished. The Harbor District will establish an Erysimum reserve area of several acres on city property near the airport. The area will be fenced to exclude dune buggies and will be used in a program to study and perpetuate the species. Details of the program will be worked out between the Harbor District and concerned agencies, and will fulfill the Corps responsibilities in this regard. Also, the Corps will mark the locations of the plants and avoid their destruction wherever possible. Some plants may be transplanted if this is feasible and recommended.

6.000 ALTERNATIVES

A. No Project

6.001 The need and justification for certain navigation improvements in Humboldt Bay has been reviewed in post-authorization investigations. These investigations reveal that the need for accomplishment of those navigational channel improvements recommended and authorized by P.L. 90-483 is more critical now than anticipated when the survey investigation was conducted in 1962-65 due to the larger-than-anticipated vessel traffic. (See Tables VI-1 and VI-2).

TABLE VI-1

EXPECTED VESSEL DELAYS IN NORTH BAY CHANNELS DUE TO TIDES, 1980, IF PRESENT DEPTH OF 30 FEET REMAINS

Vessel Draft (ft.)	Trips Per Year	Probability of Delay 1/ (percent)	Waiting Time (Average Hours Per Delay)	Total Hours
(1)	(2)	(3)	(4)	(5)
31	17	91.4	11.3	175.6
30	39	82.2	10.2	327
29	42	31.3 2/ and	3.9 and	51.3
		26.5 3/	3.3	36.7
28	42	25.7 2/ and	3.2 and	34.5
		15.3 3/	1.9	12.2
27	26 4/	20.9	2.6	14.1
26	26	13.3	1.6	5.5
25	12	0	0	0
Total Trips	204		Total Delay	657
Adjustment for Delays under Proposed Channel Conditions (35 feet):				
31	17	13.3	-1.6	-3.6
			Net Hours Delay	653

1/ For presently authorized project depth of 30 feet.
2/ First tidal curve depression. (LLW)
3/ Second tidal curve depression. (HLW)
4/ For drafts of 27 feet and less, trips to Fields Landing have been netted out.

TABLE VI-2

PROJECTED DISTRIBUTION OF ALL VESSEL TRIPS
BY VESSEL DRAFT IN HUMBOLDT HARBOR,
1970 - 2030

Actual Vessel Draft (ft.)	1970	1980	1990	2000	2010	2020	2030
20 or less	123	91	83	71	75	77	77
21	22	15	11	11	11	12	12
22	33	15	11	11	11	12	12
23	23	15	15	11	11	12	12
24	25	15	18	14	15	15	15
25	19	18	18	14	15	15	15
26	33	39	39	43	45	47	47
27	27	39	43	46	48	50	50
28	33	42	44	48	50	51	51
29	37	42	41	43	44	46	45
30	27	39	38	41	43	45	45
31 and over	6	17	21	25	27	29	30
TOTAL	408	387	382	378	395	411	411

6.002 The no action alternative would not require any widening, deepening, or extension of navigation channels in Humboldt Bay. Nor, of course, would there be any dredge material to be disposed of. However, the existing channel depths are inadequate to accommodate current fully-loaded dry cargo vessel traffic, without significant tidal delays. Under present conditions, many ships which cannot leave the harbor when fully loaded are routed elsewhere to be filled. These important economic benefits involving time savings and increased distance travelled would be foregone under the no action alternative. Beneficial effects of the no action alternative would include no impacts on fauna and flora and habitats both within the channel and the disposal sites proposed for the alternatives. Since as discussed in Chapter 4.000, these impacts do not appear to be great and since the economic benefits would be large, the no action alternative has been set aside as unresponsive to documented needs for some scope of improvement in the existing Federal navigation project in Humboldt Bay.

B. Variations in Project Parameters

6.003 1. Depth. The last authorized deepening of this harbor was in 1952 when Congress authorized depths of 40 feet for the Entrance Channel and 30 feet for the North Bay, Eureka and Samoa Channels. Prior to this they had been dredged to only 30 and 26 feet respectively. The 35-foot depths authorized by Congress for this project in 1968 are in response to an increasing frequency of deeper draft vessels calling at the harbor (see Table VI-3). Port facilities deeper than 35 feet and the use of ships with a need for greater drafts are not currently planned for the harbor. Therefore, providing channels deeper than 35 feet is not justified or economically sound at this time.

TABLE VI-3

AVERAGE DRAFTS OF ALL DRY CARGO
VESSEL TRAFFIC, HUMBOLDT BAY

	Draft (Weighted Average)		Standard Deviation	
Year	All Vessels (outbound)*	Vessels greater than 25 feet (outbound)	All Vessels	Greater than 25 Feet
1963	23.1	27.4	2.79	1.15
1964	23.2	27.2	2.69	1.11
1965	23.1	27.4	2.75	1.23
1966	23.8	27.4	2.99	1.38
1967	24.5	27.9	3.26	1.44
1968	24.9	28.1	3.41	1.63
1969	25.5	28.4	3.56	1.85
1970	26.0	28.2	3.15	1.52
1971	26.0	28.7	3.50	1.90
1972	26.0	28.5	3.14	1.77

* Vessels 18 feet and under in draft were excluded from calculations.

6.004 A 35-foot channel will safely provide passage for a fully loaded boat drawing 30 feet, as indicated in Table VI-4.

TABLE VI-4

Design Factor	English Dimensions in Feet	Metric Dimensions in Meters
Static draft	30	9.1
Squat	2	0.6
Trim	1	.3
Maneuverability	2	.6
Design Depth	35	10.6

6.005 2. Widening of Turns and Channel Widths. Ships turn on curves, but they navigate along range segments defined visually by buoys or mathematically set courses. Therefore, the channel widening recommended in this project employs the apex cutoff method for defining the extent of channel widening at bends. This is in keeping with segment dimensions shown on the navigation chart. Among the significant parameters used to determine the width required in the channel and at channel bends are the angle of deflection, radius of curvature, turning track of vessel, vessel maneuverability, current velocity, vessel speed, the judgment of experienced pilots and the location of aids to navigation.

6.006 The widening of the Samoa Channel to 400 feet is based on safety, economics and efficiency.

6.007 The widths for the 3 channels considered in this project are based upon one way traffic.

3. Special Features.

6.008 (a) Anchorage Area: The anchorage area originally proposed in the environmental working paper has been dropped from consideration because of the lack of local support and the fact that it cannot be economically justified. Ship time has become much more expensive in recent years and time spent at anchorage away from the landing docks has been greatly reduced.

6.009 (b) Turning Basin: Turning basins should normally provide a minimum of 150 percent of the design vessel length for tug assisted turnaround. Thus a vessel with a length of 640 feet (a common length for ships calling at Humboldt Bay) would require a combined channel and turning diameter of about 1,000 feet. A turning area with approximate dimensions of 1,100 feet by 1,000 feet would be provided at the upper end of the Samoa Channel. A minimum of future maintenance dredging is expected due to the constricted tidal currents in this reach of the bay.

6.010 (c) Fields Landing Channel: The widening of this channel was proposed by local interests, but is not proposed as part of this project. The feasibility of this authorization is being considered as a separate project.

6.011 (d) Entrance Channel: Although extremely heavy waves occasionally make the entrance channel impassable, a deepening or widening is not economically justified under present conditions. Although deeper draft vessels may occasionally call at the harbor, it is not planned to provide facilities for super-tankers or other such large sized ships.

C. Dredging Alternatives

6.012 Although it is technically feasible to dredge the harbor in a variety of ways, definite constraints act to limit the real possibilities. These constraints are summarized in Table VI-5. High turbidity and excessive costs rule out the use of clamshell dredging. Another method of accomplishing the project would be by using a Government hopper dredge. However, there are only three hopper dredges available in the Pacific Ocean for projects between San Diego and Alaska plus Hawaii. Since each dredge handles 6-12 projects per year, each of which lasts from 1-7 weeks plus ship maintenance time, it is not feasible to schedule a dredge for the entire 6 to 7 months that would be required to complete the work at Humboldt Bay. Also, it is national Corps policy not to use government dredges when creating new or deeper channels. This is so in order to avoid unfair competition with private business. For these reasons, the hopper dredge is scheduled only for 190,000 cubic yards in the area where high wave action precludes the use of a hydraulic dredge. The remaining method of dredging is by hydraulic dredge using a pipeline to dispose on land. This is the method that is recommended for this project.

6.013 The use of a hydraulic pipeline dredge rules out disposal at sea because it is not technically possible to run a pipeline out in the ocean. Also, high pumping costs would not be in the public interest. This method produces less turbidity at the dredge site than any of the other methods, thus minimizing negative impacts on biota. These factors, plus the moderate cost and proven technology make hydraulic dredging the method of choice for this project.

D. Disposal Location Alternatives

6.014 1. Locations Considered. The wide range of disposal locations considered include; the ocean at 9.3 miles offshore, the ocean 1.5 miles offshore; the beach on the North Spit; the beach behind the south jetty; several small bayside areas in Eureka; the proposed freeway site in Eureka; several sites inland on the North Spit (adjacent to the airport, the Coast Guard property, the Simpson Timber Company land and a site adjacent to the bay); and on Indian Island. These sites are shown on Plate 22.

6.015 2. Locations Recommended. The land disposal sites recommended are designated as 13-B and 13-C. Both are located on the North Spit (See Plate 23). The nearshore ocean area is recommended for disposal by hopper dredging, but would not receive large volumes of materials.

6.016 The choice of these sites is based on environmental impact considerations, costs, future land use plans, consultation with other agencies and the desires and capabilities of the local sponsor. The

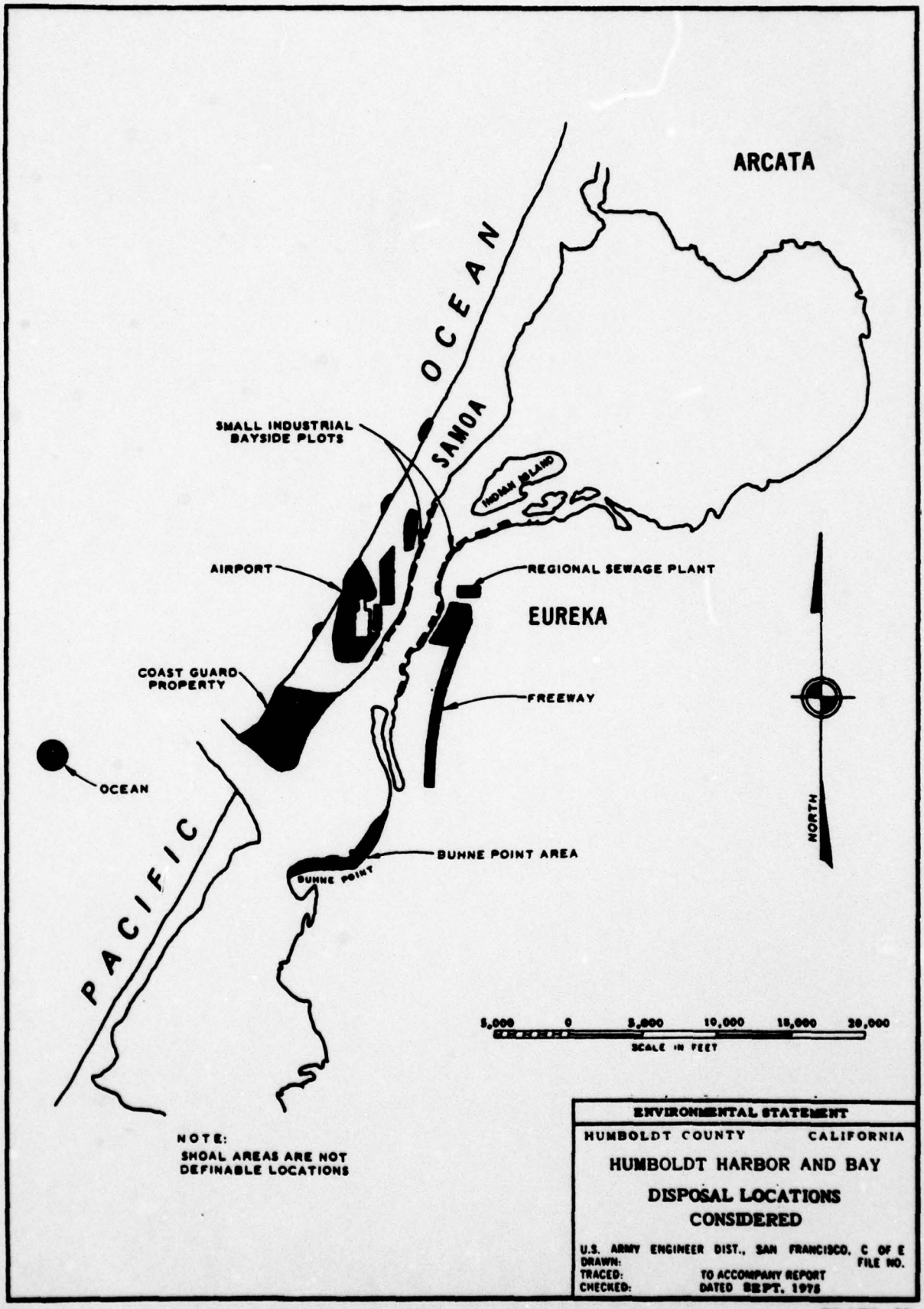

ARCATA
OCEAN
SAMOA
SMALL INDUSTRIAL BAYSIDE PLOTS
INDIAN ISLAND
AIRPORT
REGIONAL SEWAGE PLANT
EUREKA
COAST GUARD PROPERTY
FREEWAY
OCEAN
PACIFIC
BUHNE POINT AREA
BUHNE POINT
NORTH
5,000 0 5,000 10,000 15,000 20,000
SCALE IN FEET
NOTE:
SHOAL AREAS ARE NOT DEFINABLE LOCATIONS
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY CALIFORNIA
HUMBOLDT HARBOR AND BAY
DISPOSAL LOCATIONS CONSIDERED
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
TRACED:
CHECKED:
FILE NO.
TO ACCOMPANY REPORT
DATED SEPT. 1975

PLATE 22

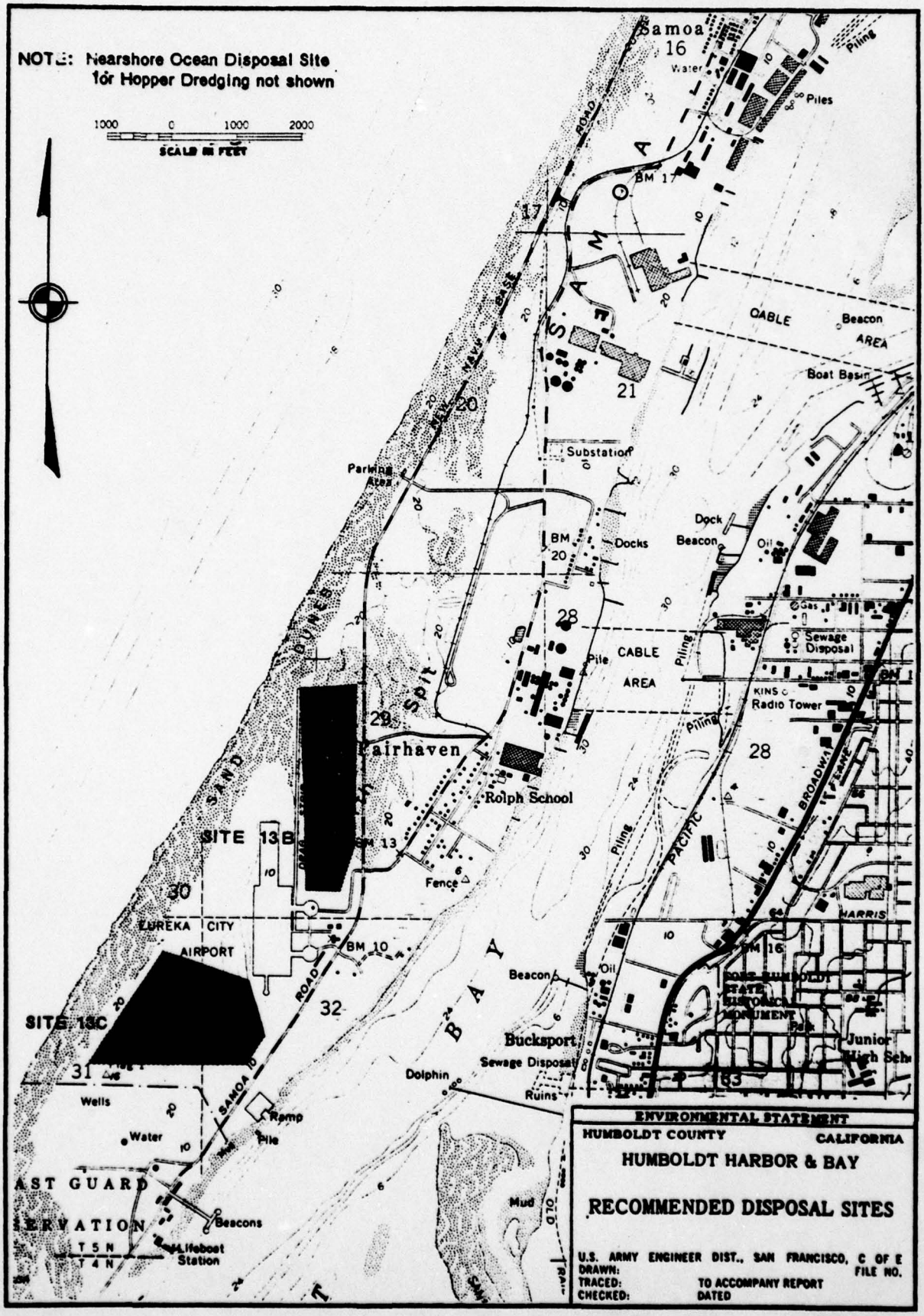

NOTE: Nearshore Ocean Disposal Site for Hopper Dredging not shown
1000 0 1000 2000
SCALE IN FEET
Samoa
16
Water
Piles
BM 17
SAMOA
17
NAVAL BASE
ROAD
CABLE AREA
Beacon
Boat Basin
21
20
Substation
Parking Area
Dock
Beacon
Oil
BM 20
Docks
28
Gas
Sewage Disposal
Pile
CABLE AREA
Piling
KINS
Radio Tower
BM
29
Spit
Fairhaven
Rolph School
SAND DUNES
SITE 13B
BM 13
Fence
30
EUREKA CITY AIRPORT
BM 10
SITE 13C
32
ROAD
BAY
Beacon
Oil
HARRIS
BM 16
STATE HISTORICAL MONUMENT
Bucksport
Junior High Sch
Sewage Disposal
Dolphin
Ruins
63
31
Wells
Water
Ramp
Pile
SAMOA
AST GUARD
SERVATION
Beacons
T 5 N
T 4 N
Lifeboat Station
Mud
OLD
TRAIL
ENVIRONMENTAL STATEMENT
HUMBOLDT COUNTY
CALIFORNIA
HUMBOLDT HARBOR & BAY
RECOMMENDED DISPOSAL SITES
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN:
TRACED:
CHECKED:
FILE NO.
TO ACCOMPANY REPORT
DATED

PLATE 23

ocean site is necessary for disposal by the hopper dredge and the nearshore site was chosen over the offshore site because the dredge material is not polluted and costs would be less.

6.017 Detailed descriptions of sites 13-B, 13-C and the ocean site are presented in 1.005-1.010.

6.018 3. Locations Not Recommended. The local sponsoring agency and the City of Eureka have expressed an interest in utilizing numerous shoreline sites on the east side of the Bay for dredge disposal areas. These sites would become industrial and port related businesses, and may in some cases, require filling of the Bay. One site proposed is an extensive marsh area between the Northwestern Pacific Railroad and U.S. 101.

6.019 The use of these sites may entail severe environmental impacts. Mitigation and compensation would have to be established with the State and Federal wildlife agencies. For these reasons the sites are not recommended. Local agencies may be considering these sites for disposal areas needed to deepen existing and new berthing areas, a local responsibility.

6.020 The freeway site is not recommended because of the excessive cost for suitable retention dikes and the doubt over the construction schedule.

6.021 The Coast Guard site was dropped from consideration because of its probable future use as a public recreation area. In a letter dated 11 September 1974, the Humboldt County Planning Department requested that the Corps drop this site from their list because they were in the beginning stages of possible acquisition of the area, most of which was to be declared surplus property and turned over to the U.S. Bureau of Land Management (BLM). In a letter dated 29 August 1974, BLM confirmed this impending transfer. Consequently, this site was not given further consideration. As of July, 1976, the Coast Guard had not taken formal action to declare the area in question as surplus property, but this is expected to occur in the future, pending analysis of a recently completed study on the impacts of fog horn noise on the land use of the site.

6.022 The Indian Island site has been dropped from consideration because of the adverse impact on natural resources.

6.023 The contingency disposal site on the beach (17) has been dropped from consideration because of the possibility of clogging the industrial outfalls located just north and south of the site. Also, a sewer outfall pipeline is scheduled to be constructed at the former site.

TABLE VI-5

COMPARISON OF ALTERNATIVE DISPOSAL METHODS

Alternative	Cost 3/	Time Required	Other Considerations
(By U.S. Gov't Hopper Dredge) All OCEAN DISPOSAL 1/	$3,600,000	6 to 7 Mo.	Dredge may not be available.
(By Clamshell Dredge & Barge) LAND DISPOSAL 2/	$7,360,000	24 Mo.	Excess Turbidity
(Hydraulic - Pipeline)	$4,330,000	20 Mo.	About 110 acres
+ Non-Federal Dikes	360,000		will be covered.
LAND DISPOSAL 2/	$4,690,000		

1/ It is contrary to Corps Policy to construct newly authorized projects with government forces.

2/ Work done by contract to private company.

3/ Add an additional $780,000 Non-Federal cost to each alternative cost. All figures are best estimates as of 1975.

7.000 RELATIONSHIP BETWEEN SHORT TERM USES OF MAN'S ENVIRONMENT AND LONG TERM PRODUCTIVITY

A. Short Term Uses of Man's Environment

7.001 The increased use of Humboldt Harbor which can be obtained by deepening the channels is considered to be a short term use and maintenance dredging will be required to perpetuate this use. Significant economic benefits will accrue to the local and regional economies, and to a lesser extent to the national economy from this use. These short term benefits will be the form of increased commerce, more efficient movement and utilization of boats and the attendant secondary benefits that occur from the latter two benefits.

7.002 The loss of benthic habitat in the channel bottom is also considered to be short term because recovery will occur in a matter of months. Impacts at the disposal site will be of much longer duration, but are not considered long term since the dunes area is in a state of continual change and revegetative and erosional processes will gradually return the area to a natural state. Impacts at ocean site are also short term.

B. Long Term Productivity

7.003 Long term productivity, when viewed as involving processes which occur continuously over a time period of many decades or centuries, is little affected by this project. Channel deepening may expose layers of gravel which offer a poorer substrate for benthos than does the sand or silt which was removed, but except for areas where tidal scouring prevents it, finer sediments will build up in the channel. Thus there should be only limited loss of long term benthic productivity. The extent of this loss would be very difficult to predict, as would its effects on the food chain.

C. The Relationships

7.004 In balancing the short term gains and losses with the long term effects, it is judged that the gains are of overriding concern. It is recommended that post project studies be initiated to determine the significance of impact on the long term benthic productivity. If funding is appropriate, this study could be a part of the Corps General Investigation of Humboldt Bay, which will be started in FY 77.

8.000 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES RESULTING FROM DREDGING AND DISPOSAL ACTIVITIES

A. Irretrievable Commitments

8.001 Irretrievability implies a loss which cannot be regained. The resources that are considered to be irretrievable once the project is completed are labor, time, money, electricity, benthos and wildlife. Although the first three of these are intangible, their expenditure is considered significant. The amount of electricity required to pump the dredged material over long distances and to heights of perhaps 20-30 feet is also very significant. Large quantities of shellfish, crustaceans, worms etc. will be lost, as will the inhabitants of the disposal areas that will be covered.

8.002 The quantities of dredged material disposed of in the ocean will dissipate throughout the sea and must be considered irretrievable but that material disposed of on land could be recovered if so desired.

B. Irreversible Commitments

8.003 Unlike irretrievability, an irreversible commitment implies an act which, once accomplished, cannot be changed in the future. The completion of this project does not involve any irreversible commitments of resources. Although the use of fuel, labor, time and money are planned for maintenance dredging of the deeper channel, this is not an irreversible decision. Thus the creation of a deeper channel is not irreversible since it would eventually silt in if not maintained. Although the populations of benthic animals that repopulate the deeper channel may be somewhat different from the existing population, there will be a recovery. Therefore the loss of benthos is not irreversible, nor is the loss of wildlife at the disposal site.

8.004 The change in land form at at the North Spit disposal sites is also not considered to be irreversible. The material (except for some silt and clay) deposited there will be basically similar in composition to the existing dunes. Although the general topography of the sites will be flatter, the exposed tops of dunes will provide some relief.

9.000 COORDINATION, COMMENT AND RESPONSE

A. Public Participation

9.001 On March 8, 1974 the Corps held a public meeting on the proposed project in order to obtain the views of interested citizens, local civic groups, government agencies, businesses and any other person wishing to comment. About 70 people attended the meeting and more than 20 statements were submitted for the record, which may be examined at the San Francisco District Office of the Corps. The prevailing viewpoint expressed was that the harbor improvements were needed.

9.002 On June 28, 1974 copies of the environmental working paper were distributed to interested Federal, State and local agencies. More than 29 responses to that document were used to modify the existing plans, and to assist in the preparation of the draft environmental statement.

9.003 On 11 March 1976 the draft environmental statement was distributed to appropriate government agencies, civic groups and any individual who submitted a written request. The formal comment and review period was 60 days. About twenty letters of comment were received and are presented in Appendix 14. Responses are presented, and changes in the text are noted. Although several comments suggested modifications of plans, the integrity of the project was not challenged.

9.004 A second public hearing on the proposed project as described in the draft environmental statement was held on 7 April 1976 in Eureka. Written and/or oral statements were presented by 21 individuals and organizations. Copies of the hearing transcript may be examined at the San Francisco District Office, Corps of Engineers, the Humboldt State University Library, the Eureka City Library or the Humboldt Bay Harbor, Recreation and Conservation District Office. Statements presented were unanimously in favor of the project.

B. Comments and Responses

GENERAL COMMENTS

9.005 Comment: The following agencies offered no adverse comments: U.S. Soil Conservation Service; U.S. Department of Health, Education and Welfare; the Westfall Stevedore Company; the U.S. Bureau of Outdoor Recreation; and, the U.S. Geological Survey.

9.006 Official comments from the U.S. Department of Interior are presented in a letter dated 14 June from the Washington D.C. Office, U.S.D.I. These comments are the same as those answered from the individual Interior Agency Field Offices.

Comment By: The U.S. Department of Commerce

Comment: The Corps should notify the National Geodetic Survey if any monuments or markers will be disturbed by construction.

Response: Contact with the Geodetic Survey has indicated that several monuments have been established in the project area. All but one has been lost. Marker "Flag One" should not be impacted by disposal, but will be relocated at project expense if necessary. Details are provided in Section 4-B.

COMMENTS RELATED TO THE PROJECT DESCRIPTION

Comment: The final statement should also indicate how much dredged material is proposed for disposal at site SF-3.

Response: Paragraph 4.065 of the draft and final statements indicates that 190,000 cubic yards of sand will be disposed of at the ocean site. Paragraph 1.009 has also been modified to indicate the quantity of material proposed for disposal at site SF-3.

COMMENTS RELATED TO THE ENVIRONMENTAL SETTING

Comment By: The U.S. Fish and Wildlife Service

Comment: The reference to exploration holes being made in the Humboldt Bay bottom in the project vicinity to study effects of possible sediment movement needs elaboration.

Response: This comment is answered in paragraph 2.031-2.039, the section on sedimentation.

Comment: Fish sampling techniques should be explained. It should be emphasized that West Coast bays function as nursery area for many species of fish.

Response: Fish sampling was accomplished with 16 and 32 foot otter trawls. This method does not adequately sample the total fish population of the Bay since many smaller, shallow water forms would not be collected. However, those forms actively using the channel bottoms do show up in the samples. The Bay does act as a valuable nursery for many juvenile forms. Paragraphs 2.074 and 2.076 have been appropriately modified to reflect these points.

Comment: In paragraph 2.084, Gunther Island should read "Indian Island."

Response: This correction has been made.

Comment: The oyster catcher is a scarce bird and only the dcublecrested cormorant nests on the Arcata Wharf ruins.

Response: These corrections have been made.

Comment: The Southern Bald Eagle is an endangered, not a threatened species.

Response: This correction has been made.

Comment By: The Wildlife Society

Comment: More information on marine mammals should be included. Appendix 7 should include Eumetopias jubata (the Steller's Sea Lion), Phocoena phocoena (the Harbor Porpoise) and Eschrichtius gibbosus (the Grey Whale). The Steller's Sea Lion and Grey Whale are associated with the nearshore and the Harbor Porpoise frequents the bay and nearshore.

Response: This correction has been made. It should be noted that whales, dolphins and porpoises are not residents of the Bay, but only visit these waters on occasion.

Comment By: The U.S. Bureau of Land Management

Comment: The term "barren sand dunes" is misleading, and the importance of this coastal resource should be emphasized.

Response: The term barren sand dunes has been applied only to part of site 13-B (para. 1.007, 4.057). It has not been applied to the remainder of 13-B or to 13-C, which are described as well vegetated. The area referred to is indeed barren with constantly shifting sands due to wind action and the effects of dune buggies. The barren section covers about 60 percent of site 13-B. It still retains value to wildlife, but as habitat must be considered only marginal.

Comment By: The Resources Agency

Comment: Reference is made to the 1973 EPA dredged material disposal criteria. The revised criteria of November 1975 should be used for comparison with the results of sediment analyses.

Response: At the present time the Corps of Engineers has not adopted the November 1975 criteria for dredge disposal, which are a regional interpretation of the 1973 Ocean Dumping Criteria as published in the Federal Register on 15 October 1973. These 1975 criteria are interim until guidelines are published pursuant to section 404 of the 1972 Federal Water Pollution Control Act. At present, the Corps still officially recognizes the 1973 criteria.

COMMENTS RELATED TO THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

Comment By: The Humboldt County Planning Department

Comment: The statement that the project "appears to conform with the recommendations and land use plans outlined in the Humboldt Bay Master Plan (see Plate 19) and in the Humboldt County General Plan 2020" could be replaced with the more positive assertion that the project does conform with these plans.

Response: Paragraph 3.003 has been modified to reflect this comment.

Comment By: The North Coast Regional Commission

Comment: Placement of dredged material is not a coastally dependent activity in that the material does not have to be placed on land adjacent to the Bay.

Response: Paragraph 3.002 has been appropriately modified.

Comment: A permit from the Coastal Commission to deposit dredged material on the proposed sites will be required.

Response: This permit is required from the local sponsor, the Humboldt Bay Harbor, Recreation and Conservation District, and not from the Corps. The Corps has notified the District of their obligation to obtain this permit.

Comment: Policy 26 of the Coastal Plan calls for the protection and restoration of rare and endangered plants and habitat types. If the dredge spoil site has a rare and endangered plant on it, the Coastal Plan policy would be not to permit this site.

Response: This comment has been answered together with another Coastal Commission comment on Erysimum menziesii in the section on comments concerning impacts, and in Chapter 5-D.

COMMENTS RELATED TO IMPACTS OF THE PROJECT

Comment By: The U.S. Fish & Wildlife Service

Comment: A discussion of postproject maintenance dredging requirements should be included.

Response: Paragraph 4.056 has been added to provide information on the impacts of the proposed project on maintenance dredging.

Comment: Some additional impacts of dredging on the shallow portions of the bay are erosion, accretion and altered circulation.

Response: These impacts have been mentioned in paragraph 4.000.

Comment: The impact of conveying spoil by pipe from the booster pump barge to the spoil site has not been discussed.

Response: Paragraph 4.064 has been added to provide information on the impacts of dredged material conveyance.

Comment: Willow type habitat on the north spit in the vicinity of disposal site 13C is unique in that it attracts migrating eastern birds. Site 13C would eliminate parts of this habitat type temporarily and perhaps permanently.

Response: Paragraphs 4.059-61 have been added or modified to address this comment.

Comment By: The Advisory Council on Historic Preservation

Comment: Please furnish additional data indicating wether National Register property is affected by the project. A section detailing this determination must appear in the statement.

Response: Paragraph 4.024 has been modified to provide this information.

Comment: Should further studies (of the beach site or the channels) determine that any element of the undertaking will affect cultural resources which are subsequently determined eligible for inclusion in the National Register, it is required to provide the Council an opportunity to comment.

Response: The contingency beach site has been dropped from consideration as a disposal site. Because it is considered that the expense is not in the public interest and because of the extremely low likelihood of finding any artifacts, the Corps does not plan to sample the dredged material for artifacts. Details are presented in 4.024-5.

Comment: The statement should mention consultation with the State Historic Preservation Officer.

Response: Paragraph 4.024 and 4.075 reflect the coordination.

Comment By: The Environmental Protection Agency

Comment: If it is shown that Dungeness crabs are likely to be present at the SF-3 ocean disposal site, the impacts resulting from the use of the site should be discussed. The location of an alternative site in the vicinity of SF-3 that would have less impact on the crabs should be explored.

Response: Paragraph 4.065 has been modified to respond to this comment. Dungeness crabs would be expected at the SF-3 site, but would also be affected at any alternative site in the vicinity. Mortality of crabs at SF-3 is likely but in the opinion of the Eureka Office of the California Department of Fish and Game, the impact on the overall population would not be noticeable. An ocean site is required for use by the hopper dredge, thereby precluding land disposal for the 190,000 cubic yards in question. Disposal further offshore would greatly increase costs and is not considered to be in the public interest since the material is not polluted.

Comment: The final statement should discuss the frequency, amount, character of material, proposed sites for disposal and impact of the maintenance dredging. It should also mention how much material is proposed for disposal at SF-3.

Response: Details of maintenance dredging may be found in the 1973 EIS on that topic. Information on changes in maintenance dredging due to this project is given in 4.056. Current maintenance dredging frequency and quantity is presented in Table II-1. The sediment to be dredged would be of the same character as that described in appendices 9-13 of this statement. Maintenance dredging is conducted by a hopper dredge and the material must therefore be disposed of at sea. Site SF-3 is to be used. The quantity proposed for SF-3 is mentioned in 4.065 and 1.004.

Comment By: Winzler & Kelly, Consulting Engineers

Comment: The location of the contingency disposal site is adjacent to two existing ocean outfall lines and the proposed wastewater outfall line. We are requesting assurance that there would be no adverse effects on the operation of the proposed outfall.

Response: The contingency beach disposal site has been dropped from consideration and will not be used for disposal. Appropriate changes have been made in the text.

Comment By: The Redwood Region Audubon Society

Comment: The Redwood Region Audubon Society is concerned over habitat destruction which will result from dredge fill to be deposited on the North Spit of Humboldt Bay. This should be considered very carefully before dumping begins. We cannot consider the disposal at the recommended sites to be an ecologically sound procedure. We strongly recommend finding alternate sites.

Response: Disposal of 2.2 million cubic yards of dredged material will create considerable impacts regardless of where it is placed. The recommended disposal sites were chosen after an evaluation of more than 13 sites in the Bay Area during the past 2 years. Major considerations placing constraints on the use of the sites are: a) cost of transporting the material; b) availability of the land for disposal; c) negative environmental impacts of disposal on areas of high natural resource value; d) timing of construction and the temporal availability of other construction sites, and e) plans and policies of various governmental agencies. In view of these constraints, it is considered that disposal at the two recommended sites will create the least overall negative impact of the alternatives which are possible. Mitigation in the form of re-vegetation with native soil, seeding of native plants and endangered species protection will help to minimize the loss of habitat. The habitat destruction is considered to be a necessary trade-off in consideration of the benefits to be derived from the project. The overall views of the public and govenmental agencies reflect that this decision is correct and in the public interest.

Comment: We fear that salt leaching from the adjacent dredge piles may kill stands of vegetation outside the actual dump sites. This would destroy a valuable recreation and wildlife study area.

Response: An existing dredged material disposal site located north of the airport and immediately east of the New Navy Base Road indicates that adjacent vegetation has not been killed by salt leaching. Plate 21 indicates that the soils at the site have a high infiltration rate. Since the area receives about 50 inches of rainfall per year, it is expected that the salt in the dredged materials will be flushed and dissipated into the shallow water ground table within a few years or less.

Comment: We are concerned about the nature of the vegetation which will replace the dunes. We are also suspicious that the sites may not become stabilized and may become a high, dry and shifting dune.

Response: As stated in 1.003 and 1.013, re-vegetation of the dunes is the responsibility of the local sponsor. Corps plans and specifications will require that existing topsoil be stockpiled and spread over the site upon completion of the fill, that native species of

plants be hydroseeded (see 4.062) and that the material be deposited in such a way as to retain existing dune peaks while creating new swales and hummocks. Also, signs urging people to stay off of the newly seeded area will be posted and maintained for two years (see 1.013). These actions should insure that the sites do not become shifting dunes, such as now existing at sites 13-B.

Comment By: The Sierra Club - Redwood Chapter, North Group

Comment: The Sierra Club questions the socio-economic study done by Research Consultants, Inc. on the proposed Woodley Island marina as this relates to channel dredging. This study speaks of increased number of jobs in the Humboldt Bay area which will result from dredging the channel. However, if one looks at all the evidence very carefully a different conclusion will be reached. The EIS says that if the channel is dredged deeper than it is now, the channel will subsequently narrow. Pat Garrett of Shell Oil Co. testified that this narrowing of the channel would force Shell Oil to withdraw from serving Humboldt Bay. This would cause a loss of jobs in this area.

Response: Details on the proposed Woodley Island Marina and Mr. Garrett's comments on the Marina may be found in the draft and final Environmental Impact Reports on that project, published by Environmental Research Consultants, Inc. in June 1975 and October 1975. Construction of the project described in this statement is not related to the Woodley Island Project and if anything, would enhance the position of Shell Oil Company. This EIS does not state that the deeper channel will subsequently narrow. Paragraph 1.002 states that all channel widths are measured at the bottom, and that side slopes are 2 horizontal to 1 vertical. In order to make a deeper channel at the same width with sloping sides, the channel will have to be somewhat wider, not narrower, thus enhancing the position of Shell Oil Company in the Harbor. However, the comment is really academic since the channel deepening will not extend to the proposed Marina.

Comment: The Department of Fish and Game has stated that the fisheries now already catch as much as they can sell. The EIS also states that the dredging will allow larger ships to use the Bay. Furthermore larger ships, being more efficient, create fewer jobs than a fleet of smaller ships. The dangers of these superships for safety in the Bay and open seas, environmental damage and loss of jobs is explored by Mostet in his well-known book SUPERSHIP.

Response: It has not been stated nor is it expected that the proposed channel improvements will result in an increased number of fishing vessels. The 35-foot depth proposed would be inadequate for superships, but will allow existing ships which use the harbor to sail with full loads and without having to wait for an appropriate high tide, thus making their operations more efficient. This is explained in Tables VI-1, 2 and 3. The prospect of fewer jobs resulting from increased use of the harbor by existing and slightly larger ships, does not hold up under scrutiny.

Comment: There should be a more careful consideration of the environmental impacts of the placement of dredged materials.

Response: The section on dredge disposal impacts has been enlarged to provide a more extensive assessment of disposal impacts (see also the response to comments by the Audubon Society).

Comment By: The Wildlife Society - Humboldt Chapter

Comment: The plan inadequately treats the effect of future maintenance operations.

Response: Paragraph 4.056 has been added to provide information on the impacts of the proposed project on maintenance dredging. Impacts of maintenance dredging are discussed in the 1973 final EIS on that subject (see also the response to comment by EPA).

Comment: Deposition at sites 13-B and 13-C would encourage commercial development of this and neighboring areas, to the detriment of existing aesthetics values. Also, winds will carry unpleasant odors to the City of Eureka.

Response: As shown in Plate 19, the proposed disposal sites are recommended for non-water related industrial use in the Humboldt Bay Master Plan. The project is in conformity with the Master Plan and with the Humboldt County General Plan 2020. The possible existence of odors from the disposal site is recognized, but since the material to be dredged is more than three-fourth sand, this impact is considered to be minor.

Comment: It is difficult to interpret the planning map due to a lack of coordinates.

Response: Plate 24 has been changed to better illustrate the area.

Comment: Material disposed of at site 17 probably will have to be removed from the entrance channel at a future date.

Response: Site 17 has been dropped from consideration as a disposal area.

Comment By: Rollin F. dal Piaz

Comment: The statement should consider the impact of turbidity on phytoplankton photosynthesis.

Response: Paragraph 4.004 has been added to address this comment.

Comment: In my opinion, habitat disturbance due to slumping of bottom sediments into adjacent channels will be considerable until natural hydraulic forces shape the channel boundary into a new hydraulic form. I view the 2-foot overdredging as recognition of this problem.

Response: Because the channels are designed with 2 horizontal to 1 vertical side slopes, slumping is expected to be minimal and should not significantly alter the impacts of the project. Overdredging is included in the contract because the techniques in dredging are not sufficiently accurate to allow excavation of a precise depth and to prevent normal siltation from upstream areas from making the channel unsafe until the next maintenance dredging.

Comment: It is questionable that the large volume of water in Arcata Bay would act to dilute the increased volume of salt water on flood tides. This is so because the Arcata Bay waters and the North Bay Channel waters do not seem to mix during each tidal change.

Response: Paragraph 4.020 has been amended to note this new information.

Comment By: The National Park Service

Comment: We are unable to judge the adequacy of the archaeological surveys mentioned in the draft statement. No indication is made of the intensity of the survey, nor the precise location of the area covered by the survey. This information, along with the name of the qualified professional individual or institution who conducted the survey, should be included in the final statement.

Response: Paragraph 2.116 has been revised to further clarify the survey formats employed, areal parameters and individuals responsible for conducting the surveys.

Comment: In the light of the potential for buried or obscured sites in the disposal site areas mentioned on page 35 of the draft statement, we recommend that a competent professional archaeologist familiar with the situation in the project area be consulted regarding whether or not the use of an exploratory back hoe across the disposal sites would be advisable.

Response: The recommended spoils disposal sites (Sites 13B and 13C of Plates 23 and 24) were subjected to intensive reconnaissance on two separate occasions by two competent, professional archaeologists in compliance with the Society for California Archaeology's established standards for archeological survey. Both reconnaissances encountered no cultural debris or indicators suggesting the existence of subsurface cultural resources. Both sites have experienced a great deal of horizontal and vertical fluctuation due to wind action. Probing the two sites with an exploratory back hoe would constitute an unnecessary action at this time based upon the available field data.


Project Above Fill
Drainage
Pipe
Pond
2
Shallow Pond
Edge
DISPOSAL SITE PLAN

PLATE 24

Comment: Neither the discussion of the archaeological surveys given on page 35 nor the discussion of the impacts on pages 52 and 62 of the draft statement and pages 42 and 44 of the draft design memorandum make any reference to the pipelines to be used to carry the dredged materials to the disposal sites and the drainage ditch and pipeline pictured in Figure 4 of the draft design memorandum. These areas should be in the survey of the contingency beach disposal site, which will be performed before the final statement has been released.

Response: The hydraulically dredged spoils will be pumped to the recommended dredge sites (Sites 13B and 13C of Plates 23 and 24) by means of 16-inch diameter pipelines which will float in aquatic areas and rest upon the surface of the gorund in terrestrial areas leading to the disposal sites. The pipelines will be subsurface below those portions of the frontage road intersecting the pipeline routes. While the two subsurface sections of pipeline will remain stationary, the exposed surface pipelines will be moved frequently depending upon operational requirements. The surface pipelines should have no adverse impact upon any cultural resources in the project area or adjacent areas. The subsurface sections of the pipeline, which would normally have the greatest potential for negative impact, should have no adverse impact upon any areal cultural resources due to prior areal disturbance caused by the initial construction of the frontage road.

The construction of a proposed pipeline connecting a drainage ditch located to the Northwest of the Eureka City Airport main dragstrip to the spoils disposal site (Site 13B of Plates 23 and 24), should have no negative impact on the cultural resources of the area. The disposal site has been thoroughly surveyed for cultural resources and a determination rendered that no such sites exist within the potentially affected area. The section of subsurface pipeline below the dragstrip as illustrated in Plate 24 will have no negative impact because the area was previously disturbed by construction of the airport dragstrip.

Comment By: The North Coastal Regional Commission

Comment: The proposed disposal areas include low spots which support healthy stands of willows and other water tolerant species which are extremely important to various species of wildlife. We would have very few concerns for site 13B and the western half of 13C, but disposal on the eastern half of 13C would indicate portions of this important willow habitat. Although we would prefer the offshore dumping of dredged materials, we realize this adds quite a considerable cost to the project. I feel we could work out exact boundary modifications of 13B and 13C to eliminate most of our concerns.

Response: Although responsibility for providing an acceptable disposal site rests with the Humboldt Bay, Harbor, Recreation and Conservation District, the estimates of site capacity are made by the Corps of Engineers. Since the contingency beach disposal site has been dropped

from consideration, it will be necessary to contain all of the dredge material within sites 13B and 13C. The Corps has estimated that these sites should contain 2.62 million cubic yards. The amount expected to be dredged is approximately 2.21 million cubic yards. Modifications of the eastern dike boundary that would reduce the size of the sites would have to be compensated for by moving the westward boundary closer to the ocean. To a limited extent this may be feasible but the Corps believes it imperative that the disposal not impact whatsoever on the primary dune, which is crucial to the geological stability of the area. Also, piling more material into a smaller site would raise the level of the disposed sand above the tops of the highest dunes, thus preventing those areas from functioning as islands of natural vegetation to re-seed the areas below. Dike boundaries will, where feasible, follow the natural contours of the dune crests rather than straight lines. If it becomes apparent that a small shift in dike boundaries could preserve some willow habitat, the change will be made. Detailed dike locations can be determined only after money is authorized for construction.

Comment: On page 23, paragraph 2.088, states that there are no rare and endangered vascular plants in this area. Even though the Inventory of Rare and Endangered Vascular Plants of California did not mention the fact that Erysimum menziesii is found in the Eureka quadrangle map, I believe Humboldt State University has specimens of this species and were collected close to, if not on the area proposed for the dumping of dredge spoils. It is also listed in appendix two of this report. For further information on this matter, you should contact either Dr. John Sawyer or Dr. James P. Smith of the Botany Department at Humboldt State University.

Response: This comment is answered in section 5-D of the statement.

Comment: Paragraph 4.056 on Page 59 states that the dredge spoils would make it easier to develop this area. This area, as recommended by the Coastal Commission, should remain undeveloped and kept in open space.

Response: Both the Humboldt County General Plan 2020 and the Humboldt Bay Master Plan recommend these areas for non-water related industrial development. Thus, there is a conflict between various plans for this area. Disposal operations from this proposed project would make it somewhat easier to develop the area, but would not extensively degrade the site for many forms of recreational use or open space.

Comment: Paragraph 4.055 on Page 59 states there would be a loss of resident species in the disposal area. It doesn't mention that the loss of this habitat will also affect migratory species. Appendix 8 is somewhat misleading in that you have ommitted the Casual and Accidental bird records in this appendix. There are approximately 34 species

of birds in these two categories that have been recorded on the spoils site or similar habitat along the North Spit. This shows the extreme importance of this habitat type. For further information on bird species recorded on or near this site, you should contact Dr. Stanley W. Harris at Humboldt State University.

Response: Paragraph 4.059 has been added to reflect this information. Casual and Accidental species are listed in Yocum and Harris, 1975.

COMMENTS PERTAINING TO ADVERSE IMPACTS

Comment By: The Resources Agency of California

Comment: We recommend that the Corps monitor the ground water wells. If water quality is significantly degraded by the disposal, we recommend that the Corps accept responsibility for the cost of connecting to the water supply the eight houses which now rely solely on well water.

Response: Environmental considerations regarding the disposal area are the responsibility of the local sponsor. The Harbor District will be required to monitor ground water and assume the costs of connecting these houses to the existing water supply if their well water is significantly degraded.

COMMENTS PERTAINING TO ALTERNATIVES

Comment By: The Wildlife Society

Comment: We request that the Corps of Engineers seriously consider the use of a hopper dredge for this project.

Response: Only three hopper dredges are available to work the area between San Diego, Alaska and Hawaii. One of these is unable to operate in the Humboldt Area because it requires a certain kind of fuel not available locally. On an annual basis, each dredge handles 6-12 projects lasting up to 7 weeks plus maintenance time. For these reasons, it is impossible to schedule a hopper dredge to work for the 6-7 months that would be required to complete the entire project. Also, in order to avoid competition with private industry, it is contrary to government policy to use hopper dredges for new or expansion projects.

Comment By: The Redwood Region Audubon Society

Comment: We recommend that materials from the hopper dredge operation be dumped on the South Spit. We also recommend that disposal sites on the South Spit be used as much as possible.

Response: The nature of the hopper dredge precludes disposal on land. Dredged material is stored in the hold of the ship and can only be unloaded through doors at the bottom of the vessel. Hydraulically dredged material cannot be deposited on the South Spit because the pipeline cannot cross the entrance channel due to constant shipping activity and dangerous waves.

COMMENTS PERTAINING TO SHORT TERM-LONG TERM USES

Comment By: The U.S. Fish & Wildlife Service

Comment: Does "erosional processes" mean that the dredged material will blow or wash away?

Response: While some wind movement of the material will undoubtedly occur, the disposal sites are not expected to become eroded or create extreme erosional problems. The high infiltration rate of the sands should prevent washing away and the re-vegetation measures should reduce the time that the sites are succeptible to wind. Some shifting of sands is natural in a dune area and erosion should actually be decreased from present level in the large blown out area which comprises about two-thirds of site 13-B.

Comment: If indirect impacts on shallow water areas are significant, then significant adverse impacts on long-term productivity would seem possible.

Response: The impacts on shallow water areas are not expected to be significant. Recent research has shown that the deeper waters of the channel areas do not often mix very extensively with the shallow waters. It is very doubtful that long-term productivity of the Bay will be impaired by this project.

COMMENTS PERTAINING TO IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

Comment By: The U.S. Fish & Wildlife Service

Comment: Elevational changes may affect the area's capability to sustain temporary wet areas, with associated vegetation types and animal populations.

Response: This comment is true. The loss of willow habitat has been addressed in the revised text of Chapter 4-B, and in response to comments by the Audubon Society and the North Coast Regional Commission.

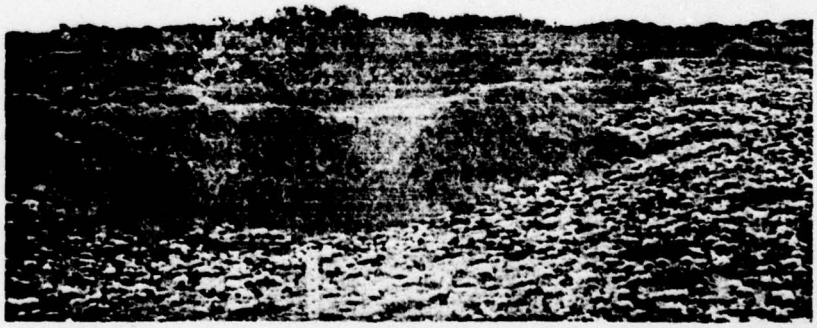
AD-A061 540 CORPS OF ENGINEERS SAN FRANCISCO CALIF SAN FRANCISCO--ETC F/G 13/2
ENVIRONMENTAL STATEMENT, NAVIGATION IMPROVEMENT HUMBOLDT HARBOR--ETC(U)
AUG 76

UNCLASSIFIED NL

3 OF 4
ADA
061540

DISPOSAL SITE 13-B
LOOKING EAST FROM
DRAGSTRIP.

DISPOSAL SITE 13-C
LOOKING WEST FROM
HIGHWAY TOWARD
WILLOW HABITAT.



ENVIRONMENTAL STATEMENT

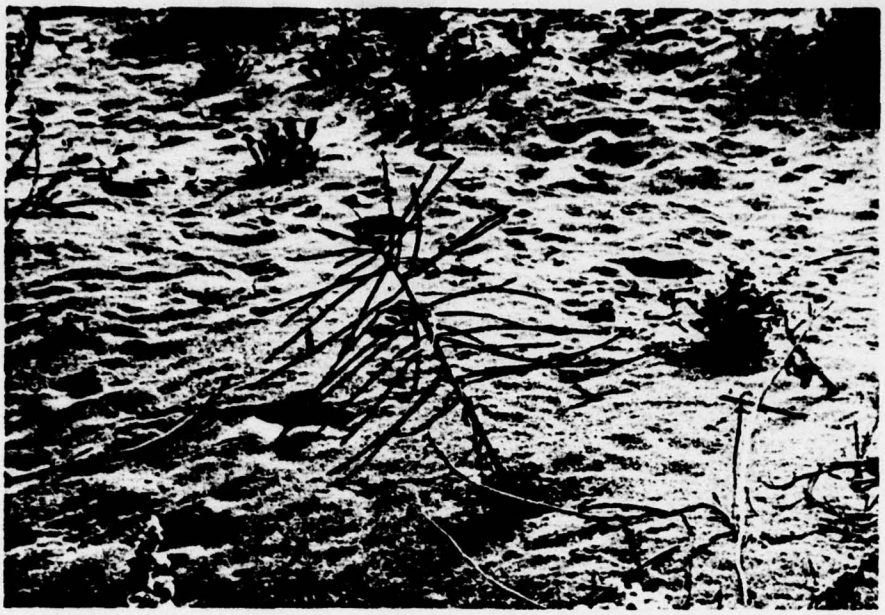
HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR & BAY

PHOTOS OF DISPOSAL SITES

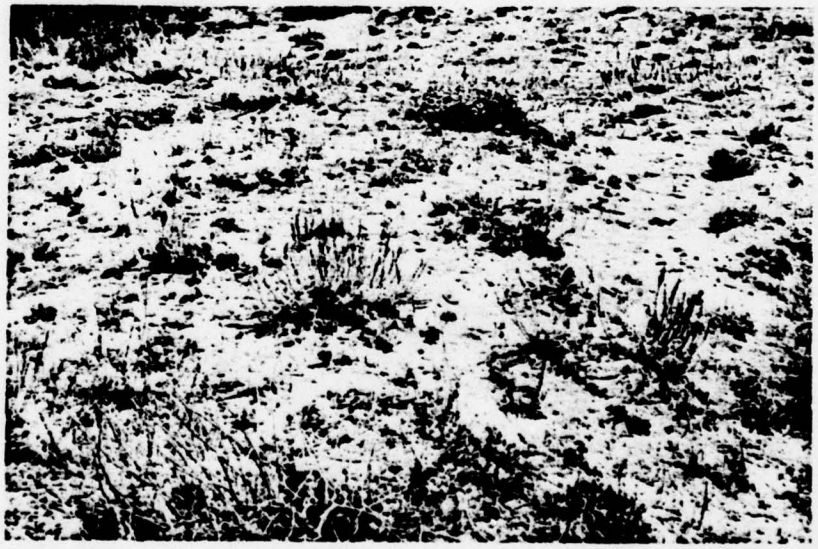
U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN: FILE NO.
TRACED: TO ACCOMPANY REPORT
CHECKED: DATED

PLATE 25



DRIED SEED PODS IN JUNE, 1976.

TYPICAL HABITAT, FOUR SPECIMENS SHOWN HERE.



ENVIRONMENTAL STATEMENT

HUMBOLDT COUNTY CALIFORNIA

HUMBOLDT HARBOR AND BAY

Erysimum menziesii

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN: FILE NO.
TRACED: TO ACCOMPANY REPORT
CHECKED: DATED

PLATE 26

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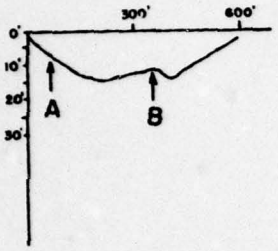
APPENDIX 1

CHANNEL PROFILES FOR BENTHIC SAMPLE TRANSECTS SAMPLED BY BOYD (75) IN HUMBOLDT BAY DEPTHS ADJUSTED TO MLLW

APPENDIX 1

CE-1



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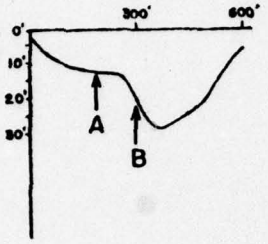

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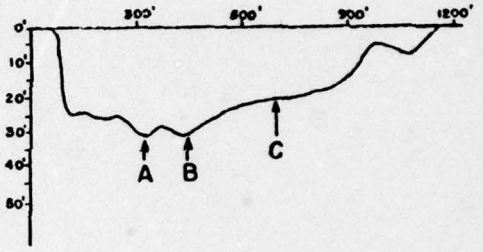

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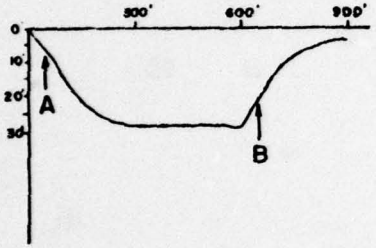

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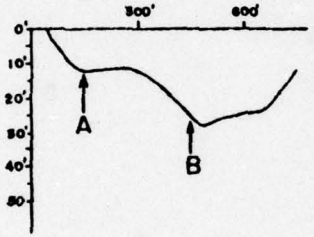

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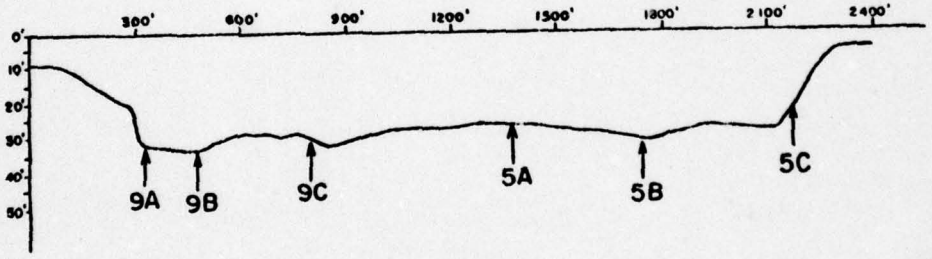

APPENDIX 1 (Cont'd)

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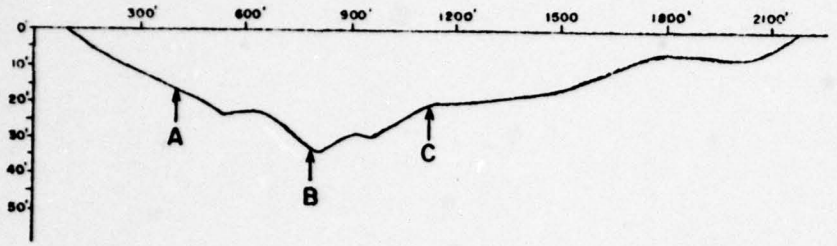

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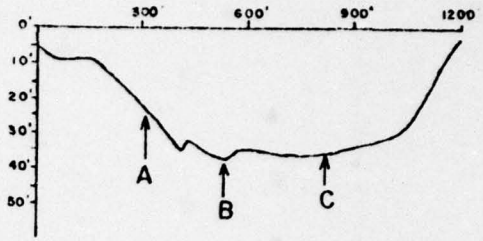

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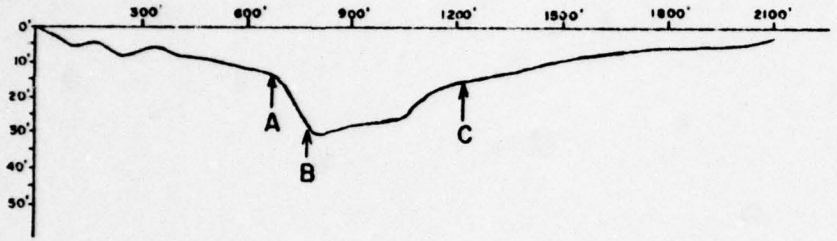

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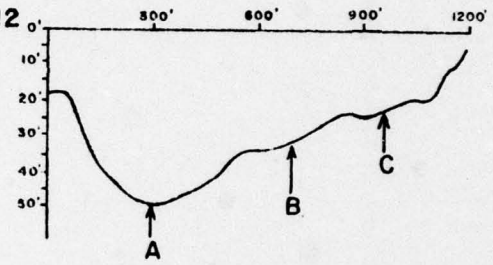

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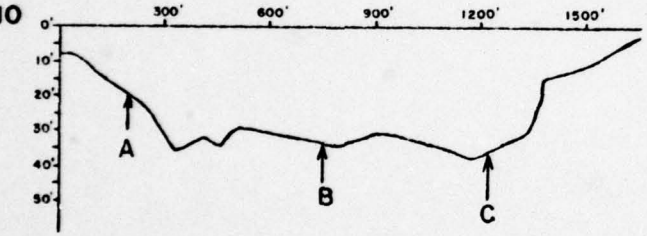

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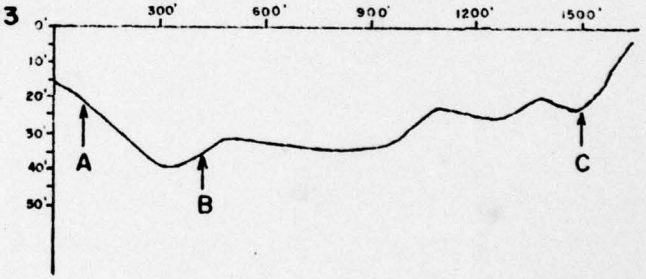

APPENDIX 1 (Cont'd)

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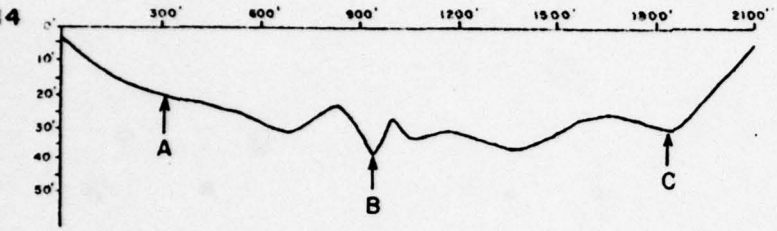

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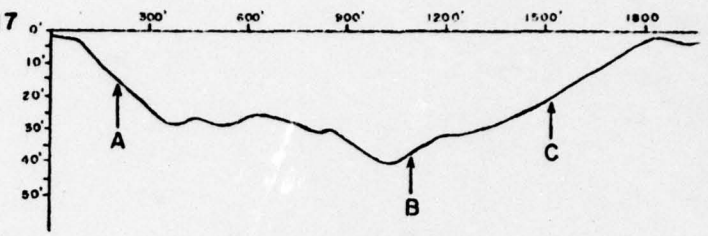

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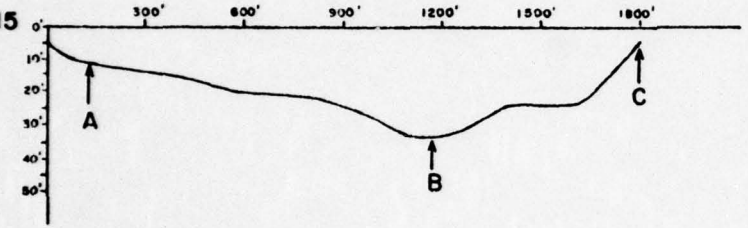

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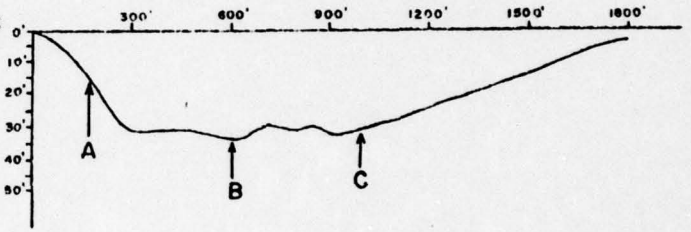

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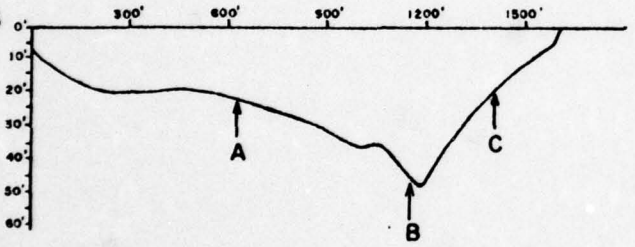

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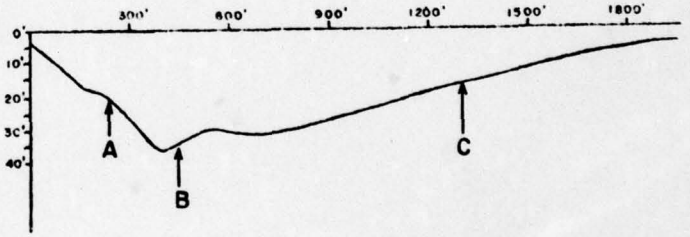


APPENDIX 2

Prominent Vegetation Around Recommended Disposal Sites

COMMUNITY	NAMES	
	Scientific	Common
Coastal Strand	Abronia latifolia	Sand verbena
	Achillea borealis	Yarrow
	Aira caryophyllea	Hairgrass
	Ammophila arenaria	European beachgrass
	Anaphalis margaritacea	Pearly everlasting
	Arctostaphylos uva-ursi	Bearberry
	Artemisia pycnocephala	Sage
	Cakile maritima	Sea rocket
	Convolvulus soldanella	Beach morning glory
	Elymus mollis	Beach wild rye
	Erigeron glaucus	Seaside daisy
	Erysimum menziesii	Wallflower
	Franseria chamissonis vars chamissonis and bipinnatisecta	Franseria
	Glehnia leiocarpa	Glehnia
	Juncus leseurii	Rush
	Lathyrus littoralis	Beach sweet pea
	Lupinus arboreus	Beach lupin
	Lupinus bicolor	Annual lupin
	Montia perfoliata	Miner's lettuce
	Plantago hookeriana	Plaintain
	Poa douglasii	Poa douglasii
	Solidago spathulata	Goldenrod
	Polygonum paronchia	Polygonum paronchia
	Tanacetum douglasii	Tansy
	Rubus vitifolium	Blackberry
	Salix hookeriana	Hooker's willow

For a listing of vegetation in other communities around mid-Humboldt County, contact the Environmental Branch, U.S. Army Engineer District, San Francisco.

APPENDIX 3

Benthic invertebrate species encountered by Boyd (1975)

ANNELIDA - CLASS POLYCHAETA

Amaena occidentalis
Ampharete goesi
Anaitides williamsi
Aricidea suecica
Armandia bioculata
Boccardia basilaris
Capitita ambiseta
Caulleriella hamata
Chaetozone multioculata
Chaetozone setosa
Cheilonereis cyclurus
Chone sp.
Cistenides brevicoma
Disoma franciscanum
Eteone dilatae
Eteone pacifica
Euclymene dilineata
Eulalia aviculiseta
Eumida sanguinea
Eupolymnia crescentis
Eusyllis sp.
Euzonus mucronata
Exogone sp.
Glycera americana
Glycera tenuis
Glycinde polygnatha
Haploscolopolus elongatus
Harmonthoe imbricata
Harmothoe lunulata
Hesperonoe adventor
Heteromastus filobranchus
Lumbrienereis japonica
Lumbrienereis zonata
Lysilla sp.
Mellina oculata
Nephtys californiensis
Nereis procera
Ophelia magna
Owenia collaris
Pholoe glabra
Pista cristata
Polydora branchycephala
Polydora ligni
Polydora socialis
Polydora websteri
Pseudopolydora kempi
Schistomeringos longicornis
Spiophanes anoculata
Spiophanes berkeleyorum
Spiophanes bombyx
Sthenelais berkeleyi
Sthenelais tertiaglabra
Streblospio benedicti
Tharxy molinaris
Typosyllis sp.

ANNELIDA - CLASS OLIGOCHAETA

Lumbricilus sp.
Paranais litoralis

MOLLUSCA

Adula diegensis
Aglaja diomedea
Alvinia sp.
Clinocardium nuttallii

ARTHROPODA - CLASS CRUSTACEA

Anisogammarus pugettensis
Archeomysis maculata
Balanus crenatus
Callinanassa californiensis

MOLLUSCA

Cailiostoma canaliculatum
Hermissenda crassicornis
Lacuna sp. cf. L. porrecta
Lyonsia californica
Macoma inquinata
Macoma nasuta
Mitrella tuberosa
Mopalia lignosa
Mysella tumida
Nassarius mendicus
Nassarius mendicus
Nucula tenuis
Odostomia sp.
Olivella biplicata
Olivella pycna
Protothaca staminea
Saxidomus nuttalli
Siliqua patula
Solen sicarius
Teilina bodegensis
Tellina modesta
Teilina nuculoides
Teilina sp.
Transennella tantilla
Tresus capax

ARTHROPODA - CLASS CRUSTACEA

Cancer anthonyi
Cancer magister
Center productus
Caprella californica
Caprella angusta
Clausidium vancouverense
Corphium sp.
Crago nigracauda
Crago sp.
Diastylopsis dawsoni
Idothea sp. A
Idothea sp. B
Lamprops sp.
Leptochelia dubia
Lophopanopeus bellus
Megamphopus martesia
Melita dentata
Metacaprella kennerlyi
Monoculodes sp.
Paraphoxus sp.
Photis brevipes
Photis sp. B
Porcelain crab larva (Petroplisthes sp.
Synchedidium rectipalmum
Tanais sp.
Tritella pilimana
Unk. amphipod sp. C
Unk. amphipod sp. D

CLASS PYCNOGONIDA

Achelia nudiuscula
Achelia sp.
Pycnogonum stearni

MISCELLANEOUS GROUPS

PORIFERA

Cliona sp.

NEMERTEA

Cerebratulus californiensis
Tubulanus pellucidus
Nemertean sp. A
Nemertean sp. B

CNIDARIA

Diadumene sp.
Metridium senile

PHORONIDA

Phoronis sp.
Phoronopsis viridus

MISCELLANEOUS GROUPS

ECHINODERMATA

Amphipholis sp.
Amphipoda occidentalis
Dendraster excentricus
Eupentacta quinquesimata
Leptosynapta sp.
Pisaster brevispinus

UNK. SIPUNCULID SP.

APPENDIX 4

ADDITIONAL INVERTEBRATES IDENTIFIED IN HUMBOLDT BAY (NOT LISTED BY BOYD, 1975)

Requests for copies of this Appendix should be addressed to the Environmental Branch, U.S. Army Engineer District, San Francisco.

APPENDIX 5

Invertebrate Biomass (0.002 gm)
Samples are 1/10 M^2
From Boyd, 1975

Sample*	Polychaetes	Nemerteans	Phoronids	Bivalves	Gastropods	Pycnogonids & Crustaceans	Misc.	Total Biomass For Sample
1A1	5.883	0.146	-	2.740	-	0.142	-	8.911
1B1	2.846	0.050	-	1.902	0.008	0.110	-	4.916
2A1	1.651	0.061	0.030	58.695	0.012	0.028	-	60.477
2B1	2.350	0.146	-	101.360	0.058	0.110	-	104.024
3A2	1.731	0.430	0.025	13.211	-	0.116	-	15.512
3B1	10.949	0.172	-	63.837	0.122	0.322	-	75.402
4A1	1.424	0.007	0.019	2.207	0.010	0.003	-	3.670
4B1	2.477	0.006	0.004	37.040	0.211	0.060	-	39.798
4C1	1.378	0.010	0.001	61.660	0.001	0.050	-	63.100
5A1	0.105	-	-	-	-	0.014	-	0.119
5B2	3.228	0.002	-	5.035	0.017	0.267	-	8.549
5C1	6.633	0.082	-	32.044	0.350	0.077	-	39.186
6A1	-	0.002	0.006	1.295	0.050	0.081	-	1.434
6B1	5.460	0.291	0.609	8.443	0.233	0.118	-	15.155

APPENDIX 5 (Cont'd)

Sample*	Polychaetes	Nemerteans	Phoronids	Bivalves	Gastropods	Pycnogonids & Crustaceans	Misc.	Total Biomass For Sample
6C1	0.281	-	-	-	-	0.083	-	0.364
7A2	2.376	0.050	-	43.210	1.477	0.053	0.311	47.477
7B2	0.663	0.010	0.031	0.537	-	0.116	-	1.357
7C1	0.158	-	-	0.658	-	-	0.008	0.824
8A1	5.310	0.211	4.780	0.277	0.071	0.043	0.045	10.737
8B1	0.068	-	-	-	-	0.027	-	0.095
8C1	0.101	0.001	-	-	0.539	0.003	-	0.644
9A1	3.813	0.031	-	0.376	0.035	0.100	-	4.355
9B1	0.159	-	-	0.682	0.140	-	1.107	1.998
9C1	0.083	-	-	-	0.211	-	2.183	2.477
10A1	8.932	0.230	30.600	31.40	0.761	0.029	0.001	71.953
10B1	0.733	0.009	-	8.585	-	0.026	0.065	9.418
10C1	1.393	0.043	-	0.318	0.323	0.024	-	2.101
11A1	4.949	0.482	6.855	1.231	-	0.172	32.169	45.858
11B1	2.420	0.035	-	7.082	0.428	0.238	-	10.173
11C1	1.716	-	-	2.407	0.004	0.005	0.407	4.539

APPENDIX 5 (Cont'd)

Sample*	Polychaetes	Nemerteans	Phoronids	Bivalves	Gastropods	Pycnogonids & Crustaceans	Misc.	Total Biomass For Sample
12A2	1.735	0.021	0.070	16.965	0.014	0.106	-	18.911
12B3	0.177	0.285	-	14.471	0.026	0.057	0.054	15.070
12C1	1.151	0.131	-	2.833	0.012	0.352	0.004	4.483
13A1	2.327	0.675	0.004	4.178	-	0.037	0.912	8.096
13B1	4.248	0.584	-	38.185	-	0.242	-	43.259
13C1	0.713	0.061	-	9.507	0.066	0.061	-	10.408
14A1	1.028	0.008	-	10.535	0.923	0.081	-	12.575
14B1	0.505	0.006	-	3.510	0.004	0.021	-	4.046
14C1	6.034	-	-	9.857	0.271	0.0005	-	16.162
15A1	2.668	0.055	0.018	30.368	1.756	0.044	-	34.909
15B1	0.244	-	-	7.260	-	2.791	-	10.295
15C1	2.834	0.043	2.900	11.028	0.004	0.095	-	16.904
16A1	0.051	-	-	1.083	-	-	-	1.134
16B1	0.035	-	-	7.207	-	-	-	7.242
16C1	1.137	0.063	-	0.130	0.485	0.051	-	1.866
17A	-	-	-	-	-	-	-	-

APPENDIX 5 (Cont'd)

Sample*	Polychaetes	Nemerteans	Phoronids	Bivalves	Gastropods	Pycnogonids & Crustaceans	Misc.	Total Biomass For Sample
17B1	0.459	-	-	7.684	-	-	-	8.143
17C1	0.084	-	-	0.210	-	-	-	0.294
18A1	3.861	1.479	13.932	6.807	0.064	0.042	-	25.395
18B1	-	-	-	4.767	-	0.047	-	4.814
18C1	0.084	-	-	12.776	-	0.047	-	12.907
19A1	1.840	-	0.560	9.930	-	1.310	-	13.550
19B1	0.120	-	-	5.870	-	-	-	5.990
19C1	0.050	-	-	0.830	-	-	-	0.880
20-1	0.450	-	-	0.010	2.890	0.140	-	3.490
Total	111.105	5.918	55.079	702.183	11.573	7.830		935.545
				Biomass - Entrance Bay Samples				
1-3	0.001	-		-	2.018	0.051		2.070
2-1	0.062	-		-	2.552	0.226		2.840
3-3	0.116	-		-	2.426	0.010		2.552
4-3	0.096	-		-	1.129	0.005		1.230

APPENDIX 5 (Cont'd)

Sample*	Polychaetes	Nemerteans	Phoronids	Bivalves	Gastropods	Pycnogonids & Crustaceans	Misc.	Total Biomass For Sample
5-1	0.198	-		-	2.756	0.005		2.959
6-1	0.016	-		-	2.878	0.005		2.899
7-2	0.093	0.008		0.035	-	-		0.136
8-1	0.058	-		-	0.566	0.026		0.651
9-3	-	-		0.008	-	-		0.008
10-1	-	-		-	-	0.001		0.008
11-2	0.016	-		-	-	0.005		0.021

*For locations, see Appendix 1.

APPENDIX 6

LISTING OF OBSERVED NEARSHORE AND HUMBOLDT BAY FISHES WITH NORMAL HUMBOLDT BAY HABITATS OF TYPICAL BAY SPECIES

Requests for copies of this Appendix should be addressed to the Environmental Branch, U.S. Army Engineer District, San Francisco.

APPENDIX 7

COMMON ANIMALS FOUND IN DREDGING AND DISPOSAL SITES**

ANIMAL HABITAT *	ANIMAL NAMES	
	Scientific	Common
Coastal strand		
	Mammals	
	Sorex vagrans	Vagrant Shrew
	Lepus californicus	Black-tailed Jackrabbit
	Sylvilagus bachmani	Brush Rabbit
	Thomomys bottae	Botta Pocket Gopher
	Reithodontomys megalotis	Western Harvest Mouse
	Peromyscus maniculatus	Deer Mouse
	Microtus californicus	California Meadow Mouse
	Zapus trinotatus	Pacific Jumping Mouse
	Mus musculus	House Mouse
	Procyon lotor	Raccoon
	Mustela frenatc	Long-tailed Weasel
	Mustela erminea	Ermine
	Mephitis mephitis	Striped Skunk
	Spilogale putorius	Spotted Skunk
	Cervus canadensis	Roosevelt Elk
	Odocoileus hemionus	Black-tailed Deer
	Amphibians and reptiles	
	Hyla regilla	Pacific Tree Frog
	Rana catesbeiana	Bull Frog
	Bufo boreas	Western Toad
	Ambystoma gracile	Northwestern Salamander
	Tricha granulosa	Rough Skinned Newt
	Rhyacotriton olympicus	Olympic Salamander
	Dicamptodon ensatus	Pacific Giant Salamander
	Taricha rivularis	Western Red-bellied Newt
	Ensatina eschscholtzi	Eschscholtz's Salamander
	Plethodon elongatus	Del Norte Salamander
	Batrachoseps attenuatus	California Slender Salamander
	Aneides lugubris	Aboreal Salamander
	A. ferreus	Clouded Salamander
	A. flavipunctatus	Black Salamander
	Sceloporus occidentalis	Western Fence Lizard

APPENDIX 7 (Cont'd)

ANIMAL HABITAT *	ANIMAL NAMES	
	Scientific	Common
Marine (Nearshore)***		
	Mammals	
	Eschrichtius gibbosus	Grey Whale
	Eumetopias jubata	Stellar's Sea Lion
	Zalophus californianus	California Sea Lion
	Phoca vitulina	Harbor Seal
	Phocoena phocoena	Harbor Porpoise
	Amphibians and reptiles	
	None	

* See Appendix 2 for plant and conifer community identification which are closely related to habitat types.

** Source: Eureka-Arcata Regional Sewage Facility Project, Environmental Impact Report, Environmental Research Consultants, Inc., Arcata, California, February 1974.

*** For further details on these animals, consult Daugherty, 1965 or Orr, 1972.

For a listing of other animals and related habitats in Mid-Humboldt County, address requests to the Environmental Branch, U.S. Army Engineer District, San Francisco.

APPENDIX 8*

BIRDS OF THE MID-HUMBOLDT COUNTY, CALIFORNIA REGION
ACCORDING TO SEASONAL, NUMERICAL STATUS AND HABITAT USE
(CASUAL AND ACCIDENTAL SPECIES NO INCLUDED)

The following terms and abbreviations are used to describe the seasonal and numerical abundance of birds in the mid-Humboldt region on the following table.

SEASONAL STATUS:

r = resident. Species is present throughout the year, usually breeds.
s = summer visitant. Occurs in summer and migration, usually breeds.
w = winter visitant. Occurs in winter and migration.
m = migrant. Occurs as a spring and fall migrant through the region.
f = fall migrant. Occurs as a fall migrant only.
sp = spring migrant. Occurs as a spring migrant only.
v = visitant. Occurs as a seasonally irregular visitant.

NUMERICAL ABUNDANCE:

A = Abundant. Seen in large numbers on every visit to the proper habitat in the proper season.

C = Common. Seen in smaller numbers on more than 50 percent of the visits to the proper habitat in the proper season.

U = Uncommon. Seen on 10 to 50 percent of the visits to the proper habitat in the proper season.

R = Rare. Either of very local distribution, or if more generally distributed, then seen on less than 10 percent of the visits to the proper habitat in the proper season. Of annual, regular occurrence.

Note: Casual and Accidental species not included. Refer to Yocom and Harris (1975).

Appendix 8 (Cont'd)

	NEARSHORE OCEAN WAVES	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
Common Loon	C	-	R	-	C
Red-throated Loon	C	-	R	-	C
Arctic Loon	C	-	R	-	U
Red-necked Grebe	R	-	R	-	R
Horned Grebe	R	-	U	-	U
Eared Grebe	U	-	U	-	C
Western Grebe	C	-	C	-	C
Pied-billed Grebe	R	-	U	-	U
Black-footed Albatross	R	-	-	-	-
Fulmar	R	-	-	-	-
Pink-footed Shearwater	U	-	-	-	-
New Zealand Shearwater	R	-	-	-	-
Sooty Shearwater	C	-	-	-	R
Fork-tailed Petrel	R	-	-	-	-
Leach's Petrel	C	-	-	-	-
Brown Pelican	C	-	C	-	C
Double-crested Cormorant	C	-	U	-	C
Brandt's Cormorant	C	-	U	-	C
Pelagic Cormorant	C	-	R	-	C
Great Blue Heron	-	-	R	-	C
Green Heron	-	-	R	-	-
Great Egret	-	-	C	-	C
Snowy Egret	-	-	R	-	R
Black-crowned Night Heron	-	-	U	U	C
Whistling Swan	-	-	-	-	R
Canada Goose	-	-	-	-	R
Black Brant	C	-	R	-	C
White-fronted Goose	R	-	R	-	R
Snow Goose	-	-	-	-	R
Mallard	R	-	R	-	U
Gadwall	-	-	-	-	R
Pintail	U	-	U	-	C
Green-winged Teal	R	-	R	-	C
Blue-winged Teal	R	-	R	-	R
Cinnamon Teal	R	-	R	-	U

APPENDIX 8 (Cont'd)

	NEARSHORE OCEAN WATERS	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
European Wigeon	R	-	R	-	R
American Wigeon	R	-	U	-	C
Shoveler	R	-	R	-	C
Wood Duck	-	-	U	U	R
Redhead	R	-	R	-	C
Ring-necked Duck	R	-	U	-	R
Canvasback Duck	R	-	R	-	U
Greater Scaup	C	-	U	-	C
Lesser Scaup	R	-	U	-	C
Common Goldeneye	R	-	-	-	R
Bufflehead	R	-	U	-	C
Old Squaw Duck	R	-	-	-	R
Harlequin Duck	R	-	-	-	R
White-winged Scoter	C	-	U	-	C
Surf Scoter	C	-	U	-	C
Common Scoter	U	-	U	-	U
Ruddy Duck	U	-	U	-	C
Hooded Merganser	-	-	R	-	R
Common Merganser	R	-	R	-	R
Red-breasted Merganser	R	-	R	-	C
Turkey Vulture	-	R	C	R	R
White-tailed Kite	-	-	R	R	-
Sharp-shinned Hawk	-	U	U	C	-
Cooper's Hawk	-	R	R	R	-
Red-tailed Hawk	-	U	U	U	-
Red-shoulder Hawk	-	-	R	R	-
Rough-legged Hawk	-	R	U	U	R
Marsh Hawk	-	R	R	R	R
Osprey	-	-	R	-	C
Peregrine Falcon	R	R	R	R	R
Merlin	-	R	R	R	R
Kestrel	-	R	U	C	-
California Quail	-	C	R	C	-
Virginia Rail	-	-	U	R	-
Sora Rail	-	-	-	R	-

APPENDIX 8 (Cont'd)

	NEARSHORE OCEAN WATERS	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
Coot	U	-	U	-	C
Semipalmated Plover	-	-	C	-	-
Snowy Plover	-	-	U	-	-
Killdeer	-	-	C	-	-
Golden Plover	-	-	R	-	-
Black-bellied Plover	-	-	C	-	-
Ruddy Turnstone	-	-	U	-	-
Black Turnstone	-	-	U	-	-
Common Snipe	-	-	U	-	-
Long-billed Curlew	-	-	R	-	-
Whimbrel	-	-	U	-	-
Spotted Sandpiper	-	-	R	-	-
Willet	-	-	U	-	-
Greater Yellowlegs	-	-	U	-	-
Lesser Yellowlegs	-	-	R	-	-
Knot	-	-	R	-	-
Baird's Sandpiper	-	-	R	-	-
Least Sandpiper	-	-	C	-	-
Dunlin	-	-	U	-	-
Short-billed Dowitcher	-	-	U	-	-
Long-billed Dowitcher	-	-	U	-	-
Western Sandpiper	-	-	U	-	-
Marbled Godwit	-	-	U	-	-
Sanderling	-	-	C	-	-
American Avocet	-	-	R	-	-
Red Phalarope	C	-	U	-	U
Wilson's Phalarope	R	-	R	-	R
Northern Phalarope	A	-	C	-	C
Pomarine Jaeger	U	-	R	-	R
Parasitic Jaeger	C	-	R	-	U
Skua	R	-	-	-	R
Glaucous Gull	R	-	R	-	R
Glaucous-winged Gull	C	-	C	-	C

APPENDIX 8 (Cont'd)

	NEARSHORE OCEAN WATERS	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
Western Gull	C	-	C	-	C
Herring Gull	R	-	R	-	R
Thayer's Gull	R	-	R	-	R
California Gull	C	-	U	-	C
Ring-billed Gull	C	-	U	-	C
Mew Gull	C	-	U	-	C
Franklin's Gull	-	-	-	-	R
Bonaparte's Gull	C	-	U	-	C
Heerman's Gull	C	-	C	-	C
Black-legged Kittiwake	U	-	R	-	R
Sabine's Gull	R	-	-	-	-
Forster's Tern	R	-	R	-	R
Common Tern	R	-	U	-	R
Caspian Tern	R	-	U	-	C
Common Murre	A	-	R	-	C
Pigeon Guillemot	C	-	-	-	C
Marbled Murrelet	C	-	-	-	C
Cassin's Auklet	C	-	-	-	R
Phinocerous Auklet	U	-	-	-	-
Tufted Puffin	U	-	-	-	-
Band-tailed Pigeon	-	C	R	C	-
Mourning Dove	-	R	R	R	-
Barn Owl	-	-	-	U	-
Great Horned Owl	-	R	-	R	-
Pygmy Owl	-	R	-	R	-
Burrowing Owl	-	-	R	R	-
Short-eared Owl	-	-	U	U	-
Saw-whet Owl	-	R	R	R	-
Black Swift	-	R	R	-	-
Vaux's Swift	-	U	U	U	-
Horned Lark	-	-	R	-	-
Violet-green Swallow	-	C	C	C	R
Tree Swallow	-	C	C	C	R
Rough-winged Swallow	-	C	C	C	R
Barn Swallow	-	C	C	C	U
Cliff Swallow	-	R	R	R	R

APPENDIX 8 (Cont'd)

	NEARSHORE OCEAN WATERS	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
Purple Martin	-	R	-	-	U
Common Crow	-	R	R	R	-
Common Raven	-	C	C	C	-
Chestnut-backed Chickadee	-	C	-	C	-
Common Bushtit	-	C	-	C	-
Red-breasted Nuthatch	-	R	-	U	-
Brown Creeper	-	-	-	R	-
Anna's Hummingbird	-	R	R	R	-
Rufous Hummingbird	-	U	U	U	-
Allen's Hummingbird	-	C	U	C	-
Belted Kingfisher	-	U	U	-	U
Common Flicker	-	C	U	C	-
Lewis's Woodpecker	-	-	-	R	-
Red-breasted Sapsucker	-	R	-	U	-
Hairy Woodpecker	-	U	-	U	-
Downy Woodpecker	-	U	-	U	-
Ash-throated Flycatcher	-	R	-	R	-
Black Phoebe	-	U	U	U	-
Say's Phoebe	-	-	R	-	-
Trail's Flycatcher	-	R	R	R	-
Western Flycatcher	-	U	R	C	-
Western Wood Pewee	-	R	R	U	-
Olive-sided Flycatcher	-	-	-	R	-
Wrentit	-	C	R	C	-
House Wren	-	R	-	U	-
Winter Wren	-	C	R	C	-
Bewick's Wren	-	C	-	C	-
Long-billed Marsh Wren	-	R	U	C	-
Mockingbird	-	-	-	R	-
Robin	-	U	U	C	-
Varied Thrush	-	-	-	R	-
Hermit Thrush	-	U	U	U	-
Swainson's Thrush	-	C	U	C	-
Townsend's Solitaire	-	-	-	R	-

APPENDIX 8 (Cont'd)

	NEARSHORE OCEAN WATERS	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
Golden-crowned Kinglet	-	U	U	U	-
Ruby-crowned Kinglet	-	C	U	C	-
Water Pipit	-	-	C	-	-
Cedar Waxwing	-	R	-	U	-
Northern Shrike	-	R	R	R	-
Starling	-	C	C	C	-
Hutton's Vireo	-	C	R	C	-
Solitary Vireo	-	R	R	U	-
Warbling Vireo	-	U	R	U	-
Orange-crowned Warbler	-	C	R	C	-
Nashville Warbler	-	R	-	R	-
Yellow Warbler	-	R	R	U	-
Yellow-rumped Warbler (Myrtle)	-	C	C	C	-
Yellow-rumped W. (Audubon's)	-	C	U	C	-
Black-throated Grey Warbler	-	U	R	U	-
Townsend's Warbler	-	R	-	R	-
Hermit Warbler	-	-	-	R	-
Macgillivary's Warbler	-	U	R	U	-
Yellowthroat	-	R	R	R	-
Wilson's Warbler	-	U	R	C	-
House sparrow	-	U	-	C	-
Western Meadowlark	-	R	C	C	-
Red-winged Blackbird	-	R	U	R	-
Northern Oriole (Bullocks)	-	C	C	C	-
Brewer's Blackbird	-	C	C	C	-
Brown-headed Cowbird	-	C	U	C	-
Western Tanager	-	R	-	U	-
Black-headed Grosbeak	-	R	-	R	-
Lazuli Bunting	-	R	R	R	-
Purple Finch	-	C	R	C	-
House Finch	-	C	U	C	-
Pine Siskin	-	U	R	C	-
American Goldfinch	-	C	U	C	-
Lesser Goldfinch	-	U	R	U	-

APPENDIX 8 (Cont'd)

	NEARSHORE OCEAN WATERS	COASTAL BRUSHFIELDS, BLUFFS	BEACHES, BEACH PONDS, LAGOONS	BEACH BRUSHLANDS	HUMBOLDT BAY OPEN WATER
Red Crossbill	-	R	-	R	-
Rufous-sided Towhee	-	C	-	C	-
Savannah Sparrow	-	R	C	U	-
Lark Sparrow	-	-	R	R	-
Dark-eyed Junco (Oregon)	-	U	R	U	-
Chipping Sparrow	-	U	-	U	-
White-crowned Sparrow	-	C	R	C	-
Golden-crowned Sparrow	-	U	-	U	-
White-throated Sparrow	-	R	-	R	-
Fox Sparrow	-	C	R	C	-
Lincoln's Sparrow	-	R	R	U	-
Song Sparrow	-	C	U	C	-

For a more complete listing of birds and habitats, contact the Environmental Branch, U.S. Army Engineer District, San Francisco, or see *.

*Source: Eureka-Arcata Regional Sewage Facility Project, Environmental Impact Report, Environmental Research Consultants, Inc., Arcata, California, February 1974.

APPENDIX 9

Results of sediment analyses at 55 substations in Humboldt Bay. See Figure 1 for substation locations. A indicates the west side of the channel, B the central area, and C the eastern side. Data from Boyd, 1975.

APPENDIX 9

Substation*	ϕ_{Mean}	ϕ_{Median}	Deviation	Skewness	% Gravel	% Sand	% Silt	% Clay	% Biogenous
1A	5.11	3.28	2.69	+0.94	--	57.9	26.9	15.2	?
1B	2.99	2.24	1.27	+1.98	1.8	81.6	9.0	7.6	3
2A	7.33	7.59	2.19	-0.08	--	3.5	51.7	44.8	?
2B	6.74	6.68	1.89	+0.14	--	5.1	52.7	42.3	?
3A	3.80	3.69	3.58	+0.06	7.9	45.2	33.1	13.8	3
3B	6.87	6.55	2.34	+0.21	--	7.7	55.3	37.0	?
4A	3.05	2.40	1.00	+2.17	--	83.9	9.6	9.5	1
4B	4.70	2.50	3.12	+0.52	5.2	54.5	25.0	15.3	7
4C	6.91	6.60	2.30	+0.22	--	6.1	56.0	37.9	5
5A	1.95	1.95	0.28	+0.13	--	100.0	--	--	4
$5B_1$	1.90	2.09	0.80	+1.07	6.1	83.8	5.8	4.3	6
$5B_2$	2.30	2.22	0.67	+3.38	0.4	86.2	8.3	5.1	5
5C	5.60	4.31	2.79	+0.73	--	45.4	34.0	20.6	--
6A	6.46	6.05	2.50	+0.17	--	16.9	51.6	31.5	--
6B	1.34	2.33	4.26	0.00	20.7	54.2	16.1	9.0	15
6C	2.80	1.79	1.89	+1.14	3.2	79.2	10.3	7.3	16

APPENDIX 9 (Cont'd)

Substation*	ϕ_{Mean}	ϕ_{Median}	Deviation	Skewness	% Gravel	% Sand	% Silt	% Clay	% Biogenous
7A	6.97	6.25	2.12	+0.27	--	5.3	59.1	35.6	--
7B	2.94	2.40	1.55	+1.63	4.3	76.4	13.1	6.2	4
7C	0.40	0.85	1.15	-0.96	12.7	87.3	--	--	35
8A	-1.23	-1.76	2.29	+0.90	68.9	23.5	4.8	2.8	16
8B	3.50	1.78	2.41	+1.27	1.8	75.7	12.7	9.8	16
8C	2.23	2.22	0.35	+0.05	--	98.3	1.70	--	5
9A	4.18	2.52	2.41	+0.99	0.3	64.5	23.6	11.6	2
9B	1.72	1.78	0.36	+0.47	1.3	98.7	--	--	3
9C	2.01	1.97	0.46	+3.80	--	89.5	6.5	4.0	2
10A	4.97	4.25	3.21	+0.34	0.8	45.1	37.7	16.4	--
10B	0.94	1.52	1.28	-0.57	8.0	87.8	4.2	--	10
10C	2.96	2.26	1.13	+2.37	--	83.8	9.5	6.7	2
11A	0.31	1.51	2.51	-0.27	30.6	63.2	3.9	2.3	10
11B	-0.10	0.75	2.18	-0.12	33.2	60.8	2.9	3.1	25
11C	-1.17	0.04	2.79	-0.39	37.5	62.5	--	--	20
12A	0.36	1.58	1.97	-0.29	21.9	76.1	2.0	--	5

APPENDIX 9 (Cont'd)

Substation*	ϕ_{Mean}	ϕ_{Median}	Deviation	Skewness	% Gravel	% Sand	% Silt	% Clay	% Biogenous
12B	0.52	1.51	2.06	-0.41	20.3	74.8	4.6	--	7
12C	0.03	1.52	2.23	-0.20	21.5	69.8	8.7	--	15
13A	0.68	2.09	1.89	-0.47	18.0	75.0	3.6	3.4	10
13B	-0.53	0.14	2.54	-0.20	41.5	55.2	2.3	--	10
13C	3.35	2.75	1.23	+0.62	5.4	71.1	17.4	6.1	10
14B	-0.29	1.00	2.21	-0.74	27.7	71.6	0.7	--	15
15A	3.99	2.43	1.91	+1.46	--	71.3	19.4	9.3	12
15B	1.14	1.23	0.62	-0.98	4.3	95.7	--	--	3
15C	3.31	2.69	1.64	+1.28	1.9	70.1	20.8	7.2	2
16A	1.08	1.45	0.74	-1.55	7.8	92.2	--	--	--
16B	1.05	1.05	0.52	-0.30	1.8	98.2	--	--	--
16C	-0.44	1.11	2.59	-0.56	43.2	56.8	--	--	4
17A	2.16	2.09	0.55	+4.72	0.4	87.1	7.0	5.5	--
17B	0.73	1.02	0.73	-0.86	6.8	93.2	--	--	8
17C	0.26	1.24	1.53	-1.04	18.0	82.0	--	--	3
18A	3.52	2.31	2.00	+1.53	0.1	68.7	23.1	8.1	5

APPENDIX 9 (Cont'd)

Substation*	ϕ_{Mean}	ϕ_{Median}	Deviation	Skewness	% Gravel	% Sand	% Silt	% Clay	% Biogenous
18B	1.79	1.79	0.32	-1.34	1.9	98.1	--	--	--
18C	1.59	1.12	0.09	-11.44	11.8	88.2	--	--	10
19A	4.69	4.42	1.81	+0.47	--	32.2	46.8	21.0	--
19B	0.07	1.05	1.63	-0.52	10.1	89.9	--	--	20
19C	1.60	1.63	0.46	-0.19	0.5	99.5	--	--	--
20	2.30	2.28	0.29	0.00	--	100	--	--	--

* For location, see Appendix 1.

APPENDIX 10

Sediment Analysis

Humboldt Harbor and Bay
Maintenance Dredging, Fiscal Year 1973

Samples taken May 1971

Location	Volatile Solids	Chemical Oxygen Demand % Dry Wt.	Kjeldahl Nitrogen % Dry Wt.	Zinc x 10^{-4}	Mercury x10^{-4}	Lead x10^{-4}
Site #1	1.10	.22	15	28	0.77	8
Site #2	1.12	.50	20	33	0.17	9

No Sample Tested Exceeds Environmental Protection Agency Present Standards.
See Plate 3 for sample test sites.

APPENDIX 11

August 21, 1974

Results on samples received from the U. S. Army Corps of Engineers — Project: Humboldt

SAMPLE # **	IOD mg/l	SAMPLE #	IOD mg/l	SAMPLE #	IOD mg/l
2D-4 PT-1	24	2D-18 PT-1	0	2D-27 PT-5	13
2D-4 PT-2	16	2D-19 PT-1	35	2D-27 PT-6	11
2D-4 PT-3	10	2D-21 PT-1	25	2D-27 PT-7	5.4
2D-4 PT-4	2.3	2D-21 PT-2	21	2D-27 PT-8	7.2
2D-4 PT-5	5.2	2D-21 PT-3	13	2D-28 PT-1	6.8
2D-4 PT-6	3.6	2D-21 PT-4	6.4	2D-28 PT-2	8.2
2D-4 PT-7	6.2	2D-22 PT-1	9.6	2D-28 PT-3	1.2
2D-4 PT-8	10	2D-23 PT-1	0	2D-28 PT-4	11
2D-4 PT-9	9.2	2D-24 PT-1	0	2D-28 PT-5	7.2
2D-7 PT-1	110	2D-24 PT-2	10	2D-28 PT-6	7.2
2D-8 PT-1	8.8	2D-24 PT-3	5.6		
2D-8 PT-2	120	2D-24 PT-4	20		
2D-9 PT-1	37	2D-24 PT-5	25		
2D-10 PT-1	31	2D-25 PT-1	0		
2D-10 PT-2	19	2D-25 PT-2	33		
2D-10 PT-3	38	2D-25 PT-3	11		
2D-10 PT-4	16	2D-25 PT-4	11		
2D-10 PT-5	46	2D-26 PT-1	1.2		
2D-10 PT-6	21	2D-26 PT-2	4.2		
2D-14 PT-1	17	2D-26 PT-3	15		
2D-14 PT-2	57	2D-26 PT-4	10		
2D-14 PT-3	49	2D-27 PT-1	7.2		
2D-16 PT-1	3.6	2D-27 PT-2	7.2		
2D-17 PT-1	17	2D-27 PT-3	8.8		
2D-17 PT-2	4.8	2D-27 PT-4	11		

**For locations see Plate 3

August 21, 1974
Results on samples received from the U. S. Army Corps of Engineers — Project: Humboldt

SAMPLE # **	IOD mg/1	BOD mg/1	SUSPENDED SOLIDS mg/1	TOTAL PHOSPHOROUS mg/1	NITRATE NITROGEN mg/1	KJELDAHL NITROGEN mg/1	ORGANO HALOGENS
2D-1 PT-1	>187	6.4	98	.02	.13	9.6	.02
2D-1 PT-2	>187	6.7	69	.03	.11	7.2	.06
2D-1 PT-3	>187	4.6	160	.02	.08	11. *	.01
2D-1 PT-4	175	1.9	56	.03	.04	12. *	.02
2D-2 PT-1	>187	1.6	98	.06	.14	6.3	.01
2D-2 PT-2	>187	8.0	51	.05	.19	8.7	.01
2D-2 PT-3	>187	3.0	51	.04	.12	13. *	.01
2D-3 PT-1	130	5.0	57	.04	.13	8.2	.04
2D-3 PT-2	>187	4.4	42	.04	.20	7.8	.04
2D-5 PT-1	>187	3.0	81	.03	.14	4.3	.02
2D-5 PT-2	180	4.9	52	.03	.03	9.6	.03
2D-6 PT-1	89	1.1	40	.01	.08	.36	<.01
2D-9 PT-2	77	1.0	350	.02	.02	1.1	.02
2D-11 PT-1	160	3.8	250	.01	.34	5.1	.02
2D-11 PT-2	120	1.7	460*	.05	.16	5.9	.02
2D-12 PT-1	>170	2.9	340	.06	.02	2.2	.03
2D-12 PT-2	110	1.5	320	.07	.10	6.2	.04
2D-13 PT-1	>170	1.2	330	.03	.08	2.8	.03
2D-13 PT-2	>170	1.0	280	.01	.04	4.3	.02
2D-15 PT-1	97	2.0	240	.4	.03	3.2	.01
2D-20 PT-1	120	11.	290	.01	.05	2.8	.02
Receiving Water		2.9	35	.05	.07	.10	.01

*EXCEEDS POLLUTION CRITERIA
**For locations see Plate 3

August 21, 1974
Results on samples received from the U. S. Army Corps of Engineers Project: Humboldt

SAMPLE # **	OIL & GREASE (mg/kg dry)	CADMIUM (mg/kg dry)	LEAD (mg/kg dry)	ZINC (mg/kg dry)	MERCURY (mg/kg dry)
2D-1 PT-1	1000	.4	8.8	76	.1
2D-1 PT-2	750	.2	12	80	.7
2D-1 PT-3	730	.2	10	77	.9
2D-1 PT-4	570	.2	6.2	62	.1
2D-2 PT-1	710	.2	14	99	.2
2D-2 PT-2	810	.2	12	88	.3
2D-2 PT-3	740	.2	14	91	.1
2D-3 PT-1	1400	.2	13	80	.3
2D-3 PT-2	660	.2	14	82	.1
2D-5 PT-1	880	.1	8.0	81	.2
2D-5 PT-2	810	.2	12	74	.4
2D-6 PT-1	190	.1	8.9	38	.2
2D-9 PT-2	230	.1	8.0	45	.2
2D-11 PT-1	750	.2	8.9	77	.2
2D-11 PT-2	180	.2	8.4	62	.2
2D-12 PT-1	450	.2	8.9	80	.2
2D-12 PT-2	360	.2	7.6	55	.3
2D-13 PT-1	350	.2	6.2	55	.3
2D-13 PT-2	610	.2	6.2	51	.1
2D-15 PT-1	370	.3	8.0	77	.1
2D-20 PT-1	860	.3	8.9	55	.3

**For locations see Plate 3

August 21, 1974
Results on samples received from the U. S. Army Corps of Engineers — Project: Humboldt

SCREEN ANALYSIS**

	2D-4 PT-1	2D-4 PT-2	2D-4 PT-3	2D-4 PT-4	2D-4 PT-5	2D-4 PT-6	2D-4 PT-7	2D-4 PT-8
+ 3/8	2.6	0	1.9	0	0	(A) 0 (B) 0	0	0
+ 10	36.7	2.2	6.4	2.3	.5	.4 .7	.7	0
+ 30	12.7	4.7	3.7	2.6	2.0	3.8 1.3	2.3	.7
+ 60	25.4	64.8	61.1	51.9	63.1	68.4 46.9	67.7	54.4
+ 100	11.5	26.9	25.6	41.5	34.1	27.2 50.4	28.9	44.0
+ 200	1.4	1.0	.9	1.3	.2	.2 .6	.3	.8
- 200	9.7	.4	.4	.4	.1	0 .1	.1	.1

	2D-4 PT-9	2D-7 PT-1	2D-8 PT-1	2D-8 PT-2	2D-9 PT-1	2D-10 PT-1 (Top) (Bottom)	2D-10 PT-2	2D-10 PT-3
+ 3/8	0	0	0	1.7	0	0 19.8	4.6	0
+ 10	.5	.4	1.6	1.9	8.1	6.7 12.8	6.6	.9
+ 30	2.1	4.3	2.9	6.4	10.3	21.1 8.1	11.4	3.4
+ 60	51.5	19.6	59.0	26.1	53.0	46.8 29.8	28.9	42.5
+ 100	45.1	60.4	30.4	39.8	25.1	19.1 25.0	40.4	48.7
+ 200	.5	4.9	1.1	8.2	1.8	3.6 2.1	4.4	4.0
- 200	.2	10.4	5.0	15.9	1.7	2.7 2.4	3.7	.5

	2D-10 PT-4	2D-10 PT-5	2D-10 PT-6	2D-14 PT-1	2D-14 PT-2	2D-14 PT-3	2D-16 PT-1	2D-17 PT-1
+ 3/8	0	0	0	0	4.3	.6	0	0
+ 10	.8	2.0	1.2	.9	10.2	10.3	.3	.7
+ 30	16.9	23.1	6.9	2.1	7.0	6.7	2.7	4.8
+ 60	62.5	46.5	47.3	51.1	43.6	18.8	80.2	74.9
+ 100	19.3	27.6	39.6	40.6	26.6	48.8	16.3	18.5
+ 200	.4	.6	4.6	3.2	3.4	7.8	.3	1.0
- 200	.1	.2	.5	2.1	4.9	7.0	.2	.1

**For locations see Plate 3

APPENDIX 11 (Cont'd)

August 21, 1974
Results on samples received from the U. S. Army Corps of Engineers — Project: Humboldt

SCREEN ANALYSIS**

	2D-17 PT-2	2D-18 PT-1	2D-19 PT-1	2D-21 PT-1	2D-21 PT-2	2D-21 PT-3	2D-21 PT-4	2D-22 PT-1
+ 3/8	0	0	0	21.8	1.6	0	0	0
+ 10	.3	.2	.7	27.7	7.0	.5	.5	.6
+ 30	10.9	4.3	4.6	12.7	2.5	2.5	2.4	2.4
+ 60	68.8	87.7	69.6	21.9	50.5	69.0	80.1	56.9
+ 100	19.2	7.4	23.4	9.9	35.0	27.4	17.0	39.4
+ 200	.7	.3	1.8	2.5	2.0	.5	0	.7
- 200	.1	.1	.4	3.5	1.4	.1	0	0

	2D-23 PT-1	2D-24 PT-1	2D-24 PT-2	2D-24 PT-3	2D-24 PT-4	2D-24 PT-5	2D-25 PT-1	2D-25 PT-2
+ 3/8	0	0	0	0	0	0	0	0
+ 10	.2	.5	2.1	.7	.7	.6	.1	.2
+ 30	26.4	34.0	39.6	7.0	16.8	13.9	2.9	2.3
+ 60	71.3	62.9	51.4	81.0	45.6	64.2	90.3	88.5
+ 100	2.0	2.5	6.3	11.1	35.0	21.0	6.6	8.8
+ 200	.1	.1	.3	.1	1.7	.2	.1	.1
- 200	0	0	.3	.1	.2	.1	0	.1

	2D-25 PT-3	2D-25 PT-4	2D-26 PT-1	2D-26 PT-2	2D-26 PT-3	2D-26 PT-4	2D-27 PT-1	2D-27 PT-2
+ 3/8	0	0	0	0	0	0	0	0
+ 10	0	.2	.4	0	.1	0	1.1	2.1
+ 30	1.8	3.5	15.9	3.3	4.9	4.3	6.0	8.6
+ 60	86.6	77.8	74.8	85.7	86.5	86.2	58.5	64.0
+ 100	10.8	18.4	8.5	10.9	8.4	9.4	33.8	25.1
+ 200	.3	.1	.3	.1	.1	.1	.5	.2
- 200	.5	0	.1	0	0	0	.1	0

**For locations see Plate 3

August 21, 1974
Results on samples received from the U. S. Army Corps of Engineers — Project: Humboldt

SCREEN ANALYSIS**

	2D-27 PT-3	2D-27 PT-4	2D-27 PT-5	2D-27 PT-6	2D-27 PT-7	2D-27 PT-8	2D-28 PT-1	2D-28 PT-2
+ 3/8	0	0	0	0	0	0	0	0
+ 10	1.8	1.3	6.2	.5	1.4	1.5	.2	0
+ 30	18.0	14.4	5.4	11.7	26.8	24.5	.4	2.6
+ 60	63.5	67.8	63.6	64.7	60.6	64.6	34.6	61.4
+ 100	16.5	16.2	24.5	22.9	11.1	9.2	62.4	35.4
+ 200	.1	.2	.2	.2	.1	.1	2.3	.6
- 200	.1	.1	.1	0	0	.1	.1	0

	2D-28 PT-3	2D-28 PT-4	2D-28 PT-5	2D-28 PT-6
+ 3/8	0	0	0	0
+ 10	0	16.6	48.7	.3
+ 30	.7	28.0	13.5	2.3
+ 60	36.0	39.1	28.5	59.5
+ 100	60.5	15.9	9.1	37.5
+ 200	2.6	.3	.2	.3
- 200	.2	.1	0	.1

**For locations see Plate 3

APPENDIX 12

CORPS OF ENGINEERS - SAN FRANCISCO DISTRICT
CHEMICAL TESTS OF SAMPLES

NAME & ADDRESS
OF LABORATORY: SOUTH PACIFIC DIVISION
P.O. Box 37, Sausalito, CA 94965
UNIT OF MEASUREMENT: mg/l
All elutriate results are times a dilution factor of 10

PROJECT TITLE: HUMBOLDT BAY
DATE OF SAMPLE: 22 - 24 May 1975
TYPE OF TEST (Bulk Sediment Analysis or Standard Elutriate): Standard Elutriate

SAMPLE NO.*	SAMPLE DEPTH	COPPER	MERCURY	CADMIUM	LEAD	ZINC	OIL & GREASE
Disposal site water		0.01-	0.0007	0.009	0.020	0.080	6.4
2D-29(B)	33.0 - 34.5	0.001-	0.00001-	0.0001-	0.001-	0.002	0.34
2D-30(C)	35.5 - 37.0	0.001	0.00006	0.0001-	0.001-	0.002	0.32
2D-31(D)	42.0 - 43.5	0.001-	0.00004	0.0001-	0.001	0.004	4.80
2D-32(A)	32.5 - 34.0	0.001-	0.00005	0.0001-	0.001-	0.003	0.68
2D-33(F)	40.0 - 40.8	0.001-	0.00005	0.0001-	0.001-	0.001	0.42
2D-34(H)	50.0 - 51.5	0.001-	0.00005	0.0001-	0.001-	0.001	0.48

*See Plate 3 for location.

No Samples on this page exceed the proposed guidelines developed pursuant to Section 404 (b) of the Federal Water Pollution Control Act published in the Federal Register on 6 May, 1975.

APPENDIX 12 (Cont'd)

CORPS OF ENGINEERS - SAN FRANCISCO DISTRICT
CHEMICAL TESTS OF SAMPLES

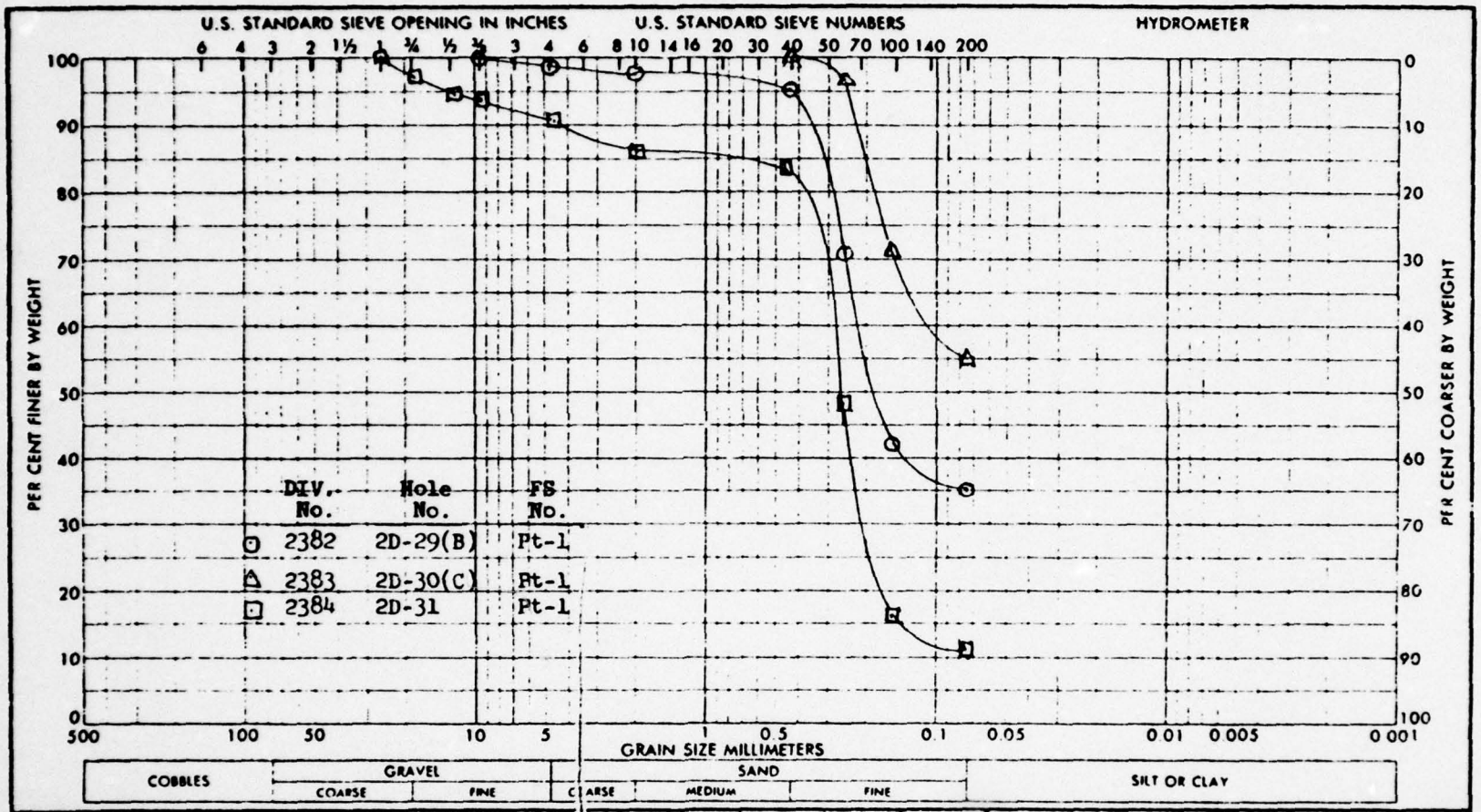
NAME & ADDRESS
OF LABORATORY: SOUTH PACIFIC DIVISION
P.O. BOX 37, Sausalito, CA 94965
UNIT OF MEASUREMENT: parts per million of dry weight

PROJECT TITLE: HUMBOLDT BAY
DATE OF SAMPLE: 22 - 24 May 1975
TYPE OF TEST (Bulk Sediment Analysis or Standard Elutriate): Bulk Sediment Analysis

SAMPLE NO.*	SAMPLE DEPTH	MERCURY	CADMIUM	LEAD	ZINC	OIL AND GREASE
2D-29(B)	33.0 - 34.5	0.3	0.2	4	56	112
2D-30(C)	35.5 - 37.0	0.2	0.3	5	65	230
2D-31(D)	42.0 - 43.5	0.2	0.3	4	35	32
2D-32(A)	32.5 - 34.0	0.2	0.3	4	56	47
2D-33(F)	40.0 - 40.8	0.1	0.1	4	39	133
2D-34(H)	50.0 - 51.5	0.1	0.2	4	34	18
E.P.A. Max. Limits for Marine (shallow) and Estuarine Water		1.5	3.0	180	300	4,000

*See Plate 3 for location.

APPENDIX 13 - SIEVE ANALYSIS



SAMPLE NO	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
2382			24.7			
2383			35.5			
2384			21.4			

GRADATION CURVES

PROJECT HUMBOLDT BAY

AREA

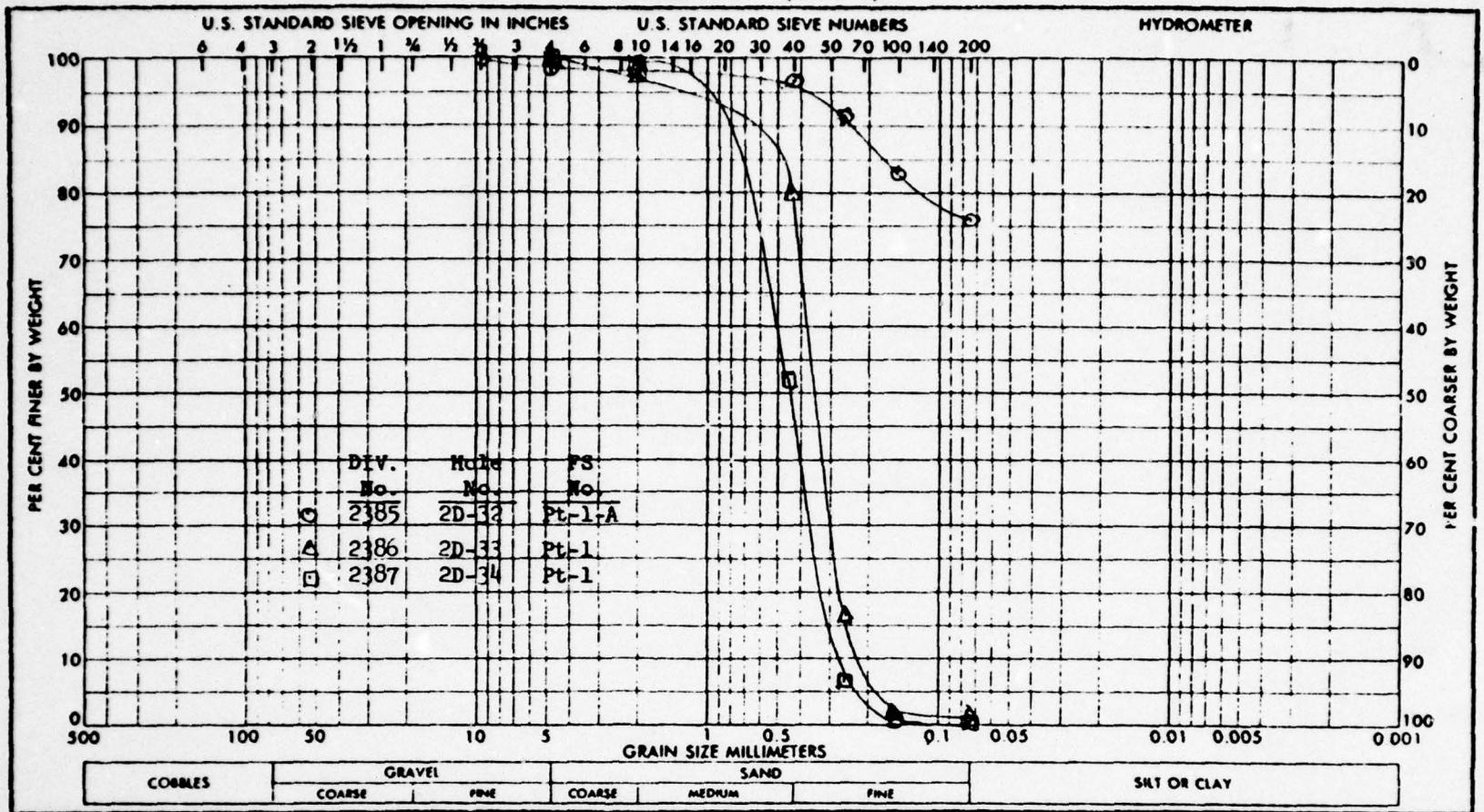
BORING NO 2D-29, 30 & 31

DATE July 1975

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

U.S. GOVERNMENT PRINTING OFFICE 1963 OF—709-124



SAMPLE NO	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
2385			42.9			
2386			22.9			
2387			21.0			

GRADATION CURVES

PROJECT: HUMBOLDT BAY

AREA:

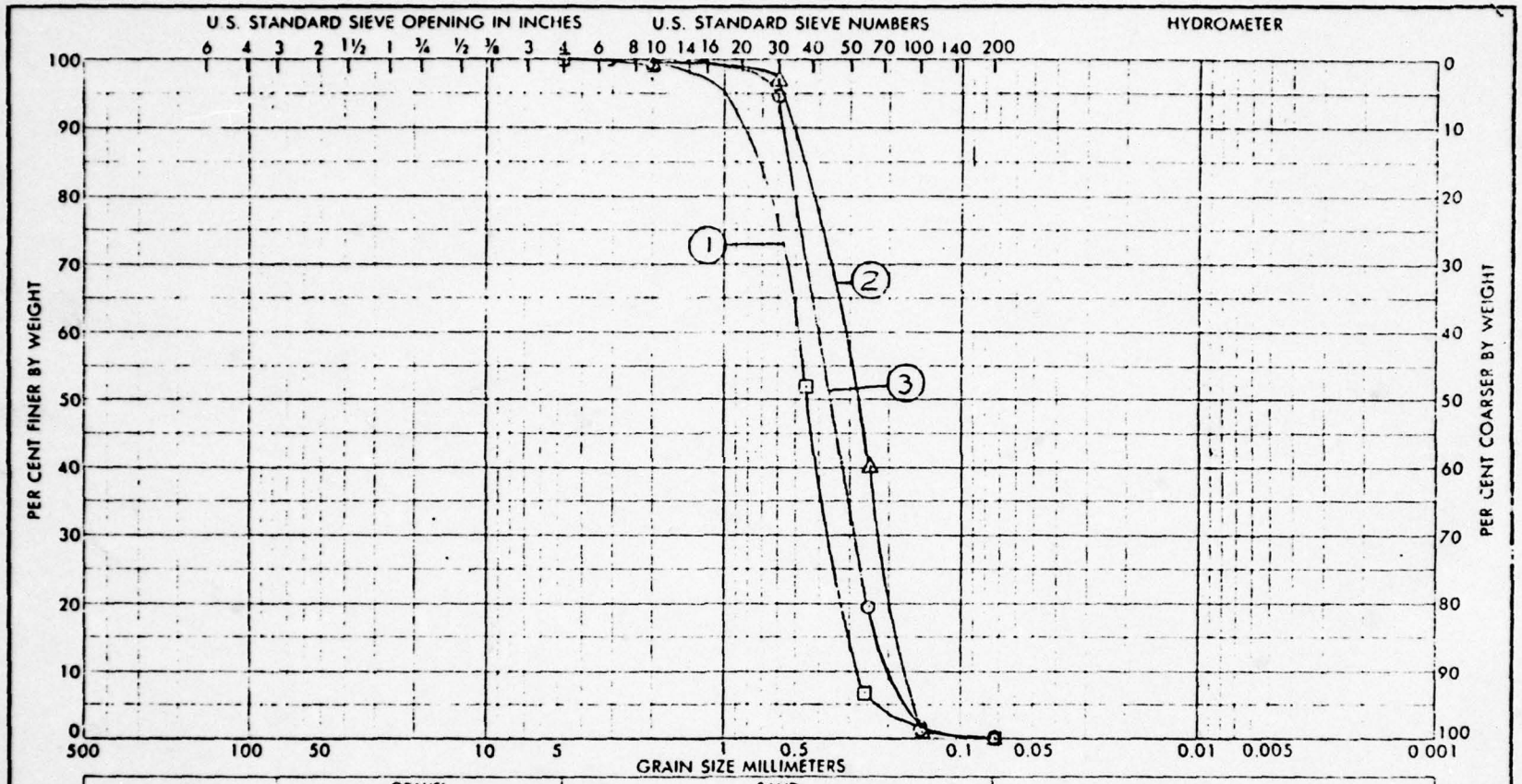
BORING NO: 2D-32, 33 & 34

DATE: July 1975

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE 1963 O-700-126



L.O.	HOLE NO	DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
1	2D-34	0.0'-1.5'	SAND	21			
2	2D-22	0.0'-2.5'	SAND	—			
3	2D-17	0.0'-2.5'	SAND	—			

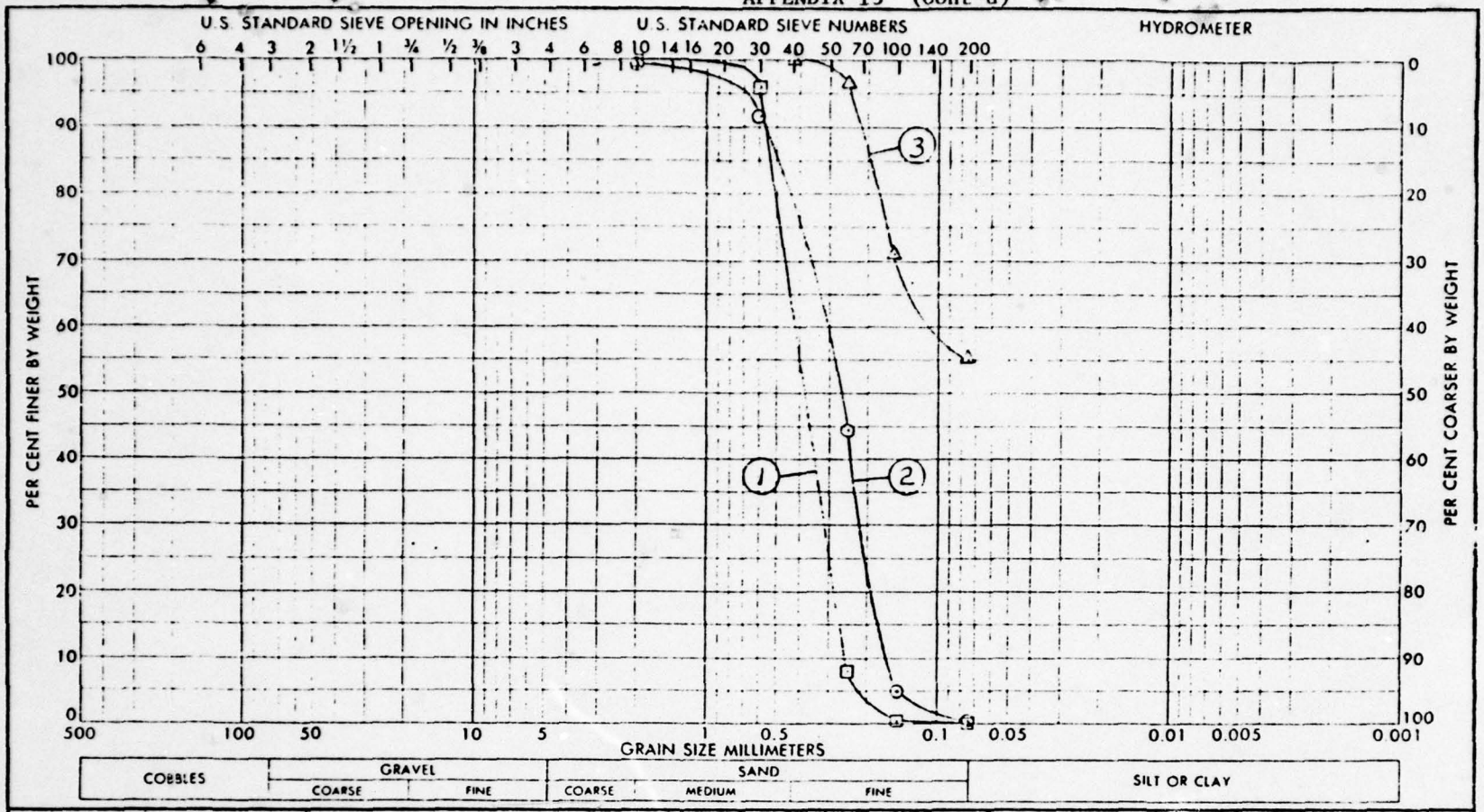
GRADATION CURVES

PROJECT HUMBOLDT HARBOR AND BAY NAVIGATION CHANNEL IMPROVEMENTS
TYPICAL SOILS IN NORTH BAY CHANNEL

ENG FORM 2087 1 MAY 63 REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE. (TRANSLUCENT)

U S GOVERNMENT PRINTING OFFICE 1963 O—709-124

FIGURE C-1



NO.	HOLE NO.	DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
1	2D-18	0.0' - 2.5'	SAND	—	—		
2	2D-10	13.5' - 14.0'	SAND	—	—		
3	2D-30	0.0' - 1.5'	SANDY SILT	36	—		

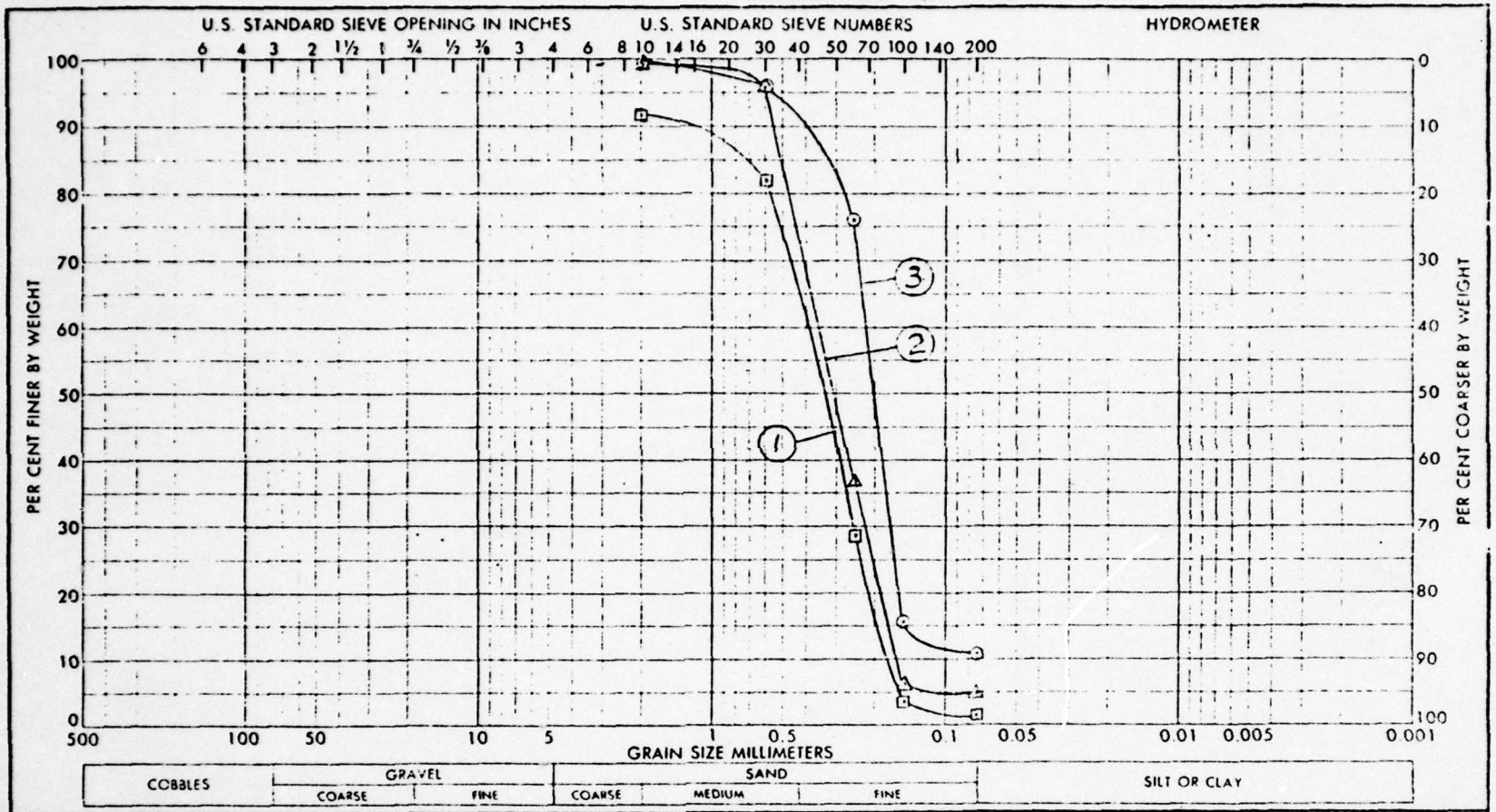
GRADATION CURVES

PROJECT HUMBOLDT HARBOR AND BAY NAVIGATION CHANNEL IMPROVEMENTS
TYPICAL SOILS IN EUREKA CHANNEL

FIGURE C-2

ENG FORM 2087 1 MAY 63 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE. (TRANSLUCENT)

U.S. GOVERNMENT PRINTING OFFICE 1963 OF—709-126



NO.	HOLE NO.	DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
1	2D-9	0.0'-2.5'	SAND				
2	2D-8	0.0'-2.5'	SAND				
3	2D-7	0.0'-2.5'	SAND				

GRADATION CURVES

PROJECT HUMBOLDT HARBOR AND BAY NAVIGATION CHANNEL IMPROVEMENTS
TYPICAL SOILS IN SAMOA CHANNEL

FIGURE C-3

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE. (TRANSLUCENT)

U.S. GOVERNMENT PRINTING OFFICE 1963 O—709-126

APPENDIX 14

LETTERS OF COMMENT ON THE DRAFT ENVIRONMENTAL STATEMENT

Advisory Council
On Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

March 22, 1976

Colonel H. A. Flertzheim, Jr.
District Engineer
Corps of Engineers, San Francisco District
Department of the Army
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

This is in response to your request of March 11, 1976 for comments on the draft environmental statement for navigation improvements in Humboldt Harbor and Bay, Humboldt County, California. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council has determined that your draft environmental statement is inadequate regarding compliance with Section 106 of the National Historic Preservation Act of 1966. Please furnish additional data indicating:

A. If no National Register property is affected by the project, a section detailing this determination must appear in the environmental statement.

B. If a National Register property is affected by the project, the environmental statement must contain an account of steps taken in compliance with Section 106 and a comprehensive discussion of the contemplated effects on the National Register property. (36 C.F.R. Part 800 details compliance procedures.)

With respect to compliance with Executive Order 11593, "Protection and Enhancement of the Cultural Environment" issued May 13, 1971, we note that while cultural resource studies completed to date indicate that no cultural resources will be affected, the Corps recognizes the need for further underwater cultural surveys in the channels and turning basins as well as the contingency beach disposal site. Accordingly, the Council

wishes to remind the Corps that should these further studies determine that any element of the undertaking will affect cultural resources which are subsequently determined eligible for inclusion in the National Register by the Secretary of the Interior, it is required to afford the Council an opportunity to comment pursuant to the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800) which sets forth the steps for compliance with Section 106 and the Executive Order 11593.

In addition, the procedures for compliance with Section 106 of the National Historic Preservation Act of 1966 and the Executive Order 11593 require the Federal agency to consult with the appropriate State Historic Preservation Officer. The State Historic Preservation Officer for California is Herb Rhodes, Director, Department of Parks and Recreation, State of California, P. O. Box 2390, Sacramento, California 95841.

Should you have any questions or require any additional assistance, please contact Michael H. Bureman of the Advisory Council staff at P. O. Box 25085, Denver, Colorado 80225, telephone number (303) 234-4946.

Sincerely yours,

Michael H. Bureman

Louis S. Wall
Assistant Director, Office
of Review and Compliance

SIERRA CLUB
Redwood Chapter
North Group
POST OFFICE BOX 256
ARCATA, CALIFORNIA 95521

April 7, 1976

Corps of Engineers
San Francisco District
100 McAllister St.
San Francisco, Cal. 94102

Re: Comments on design of navigation improvements authorized for Humboldt Harbor and Bay, California

Sirs:

The Sierra Club questions the socio-economic study done by Research Consultants, Inc. on the proposed Woodley Island marina as this relates to channel dredging. This study speaks of increased number of jobs in the Humboldt Bay area which will result from dredging the channel. However, if one looks at all the evidence very carefully a different conclusion will be reached. The EIS says that if the channel is dredged deeper than it is now, the channel will subsequently narrow. Pat Garrett of Shell Oil Co. testified that this narrowing of the channel would force Shell Oil to withdraw from serving Humboldt Bay. This would cause a loss of jobs in this area.

The Dept. of Fish and Game has stated that the fisheries now already catch as much as they can sell. The EIS also states that the dredging will allow larger ships to use the Bay. Furthermore larger ships, being more efficient, create fewer jobs than a fleet of smaller ships. The dangers of these superships for safety in the Bay and open seas, environmental damage and loss of jobs is explored by Mostet in his well-known book SUPERSHIP.

The secondary benefits mentioned in the EIS would not occur. Humboldt Bay supports a fisheries and timber industry that provides money to the local economy through wages paid workers. The dredging of the scope mentioned would cause a possible net loss of jobs.

The Board of Supervisors does not wish a greater recession in Humboldt County. Therefore, we ask the Corps of Engineers to critically review the assumptions made concerning the basis of economic development, size of proposed projects in Humboldt Bay, efficiency of superships and the number and quality of jobs in shipping and related industries which it is claimed would result from this proposed dredging and proposed marina.

We are also concerned that there should be more careful consideration of the environmental impacts of the placement of the spoils of the dredging. These spoils probably will have a far greater impact than the EIS speaks of.

Bill Devall
Conservation Chairman

Bob Smith
consultant

CABLE ADDRESS
"WESTFALL EUREKA"

TWX 510-742-6015
Telephone 443-5688

WESTFALL STEVEDORE COMPANY
GENERAL STEVEDORING
FOOT OF WASHINGTON STREET
P. O. BOX A
EUREKA, CALIFORNIA 95501

April 5, 1976

Colonel H. A. Flertzheim, Jr.
U. S. Army Corps of Engineers
San Francisco District
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

We received copies of the General Design Memorandum and the Environmental Impact Statement on the Harbor Improvement Project for Humboldt Bay and have given them careful study. We wish to take this opportunity to commend you on your research and planning efforts and to voice our total support of the project.

The shipping industry continues to be revoluntionized due to increased mechanization and the construction of still larger vessels. These longer, deeper draft ships can carry more tonnage which enables them to make fewer trips. With these larger vessels there has been a corresponding increase in operating costs. Inadequate depths in our existing channels are causing more frequent delays to vessels using this port - delays which result in higher operating costs, delays in shipment and light loading. Our depressed economy has already lost business to other ports through cancellation or diversion of vessels.

Humboldt Harbor's competative position in the shipping industry must be maintained. As your study reveals, the volume of cargo exported, both actual and projected, and the benefits to be realized in reducing vessel operating expenses, more than justify the cost of this project. Again, we express our full support of this vital project which is necessary for the continuation and development of this port.

Very truly yours,

WESTFALL STEVEDORE CO.

Leslie M. Westfall

LMW/cy

WINZLER & KELLY
CONSULTING ENGINEERS
A Corporation

JOHN R. WINZLER - CE 9878
ROBERT F. KELLY - CE 11005
RONNIE N. CLIFFORD - CE 14071

633 THIRD STREET • P.O. BOX 1345 • EUREKA, CALIFORNIA 95501 • PHONE (707) 443-8326

9 April 1976

U.S. Army Corps of Engineers
San Francisco District
100 McAllister Street
San Francisco, California

Gentlemen:

Re: Draft Environmental Statement
Humboldt Harbor and Bay California
Navigation Improvement

We have reviewed the draft environmental statement for the subject project. As the engineers for the Humboldt Bay Wastewater Authority responsible for the design of an ocean outfall we are concerned about a specific impact of the project which was not identified in the EIS.

The location of the contingency dredge spoil disposal site (Site 17 of Plate 23) on the ocean beach is adjacent to the proposed ocean outfall line. It is also adjacent to two existing ocean outfall lines. The existing lines have experienced operational difficulties due to sanding in of their diffuser sections. Although the proposed outfall line is somewhat longer than the existing lines, and is being designed to prevent sanding in of the diffuser under natural conditions, we are concerned that the possible disposal of a large volume of dredge spoil at the contingency site could adversely affect the operation of the outfall.

We are requesting that this problem be investigated and addressed in the final environmental statement, and assurance provided that there would be no adverse effect on the operation of the proposed outfall. We have attached a preliminary plan and profile for the proposed outfall to assist you.

If you should have any questions regarding this matter, please call.

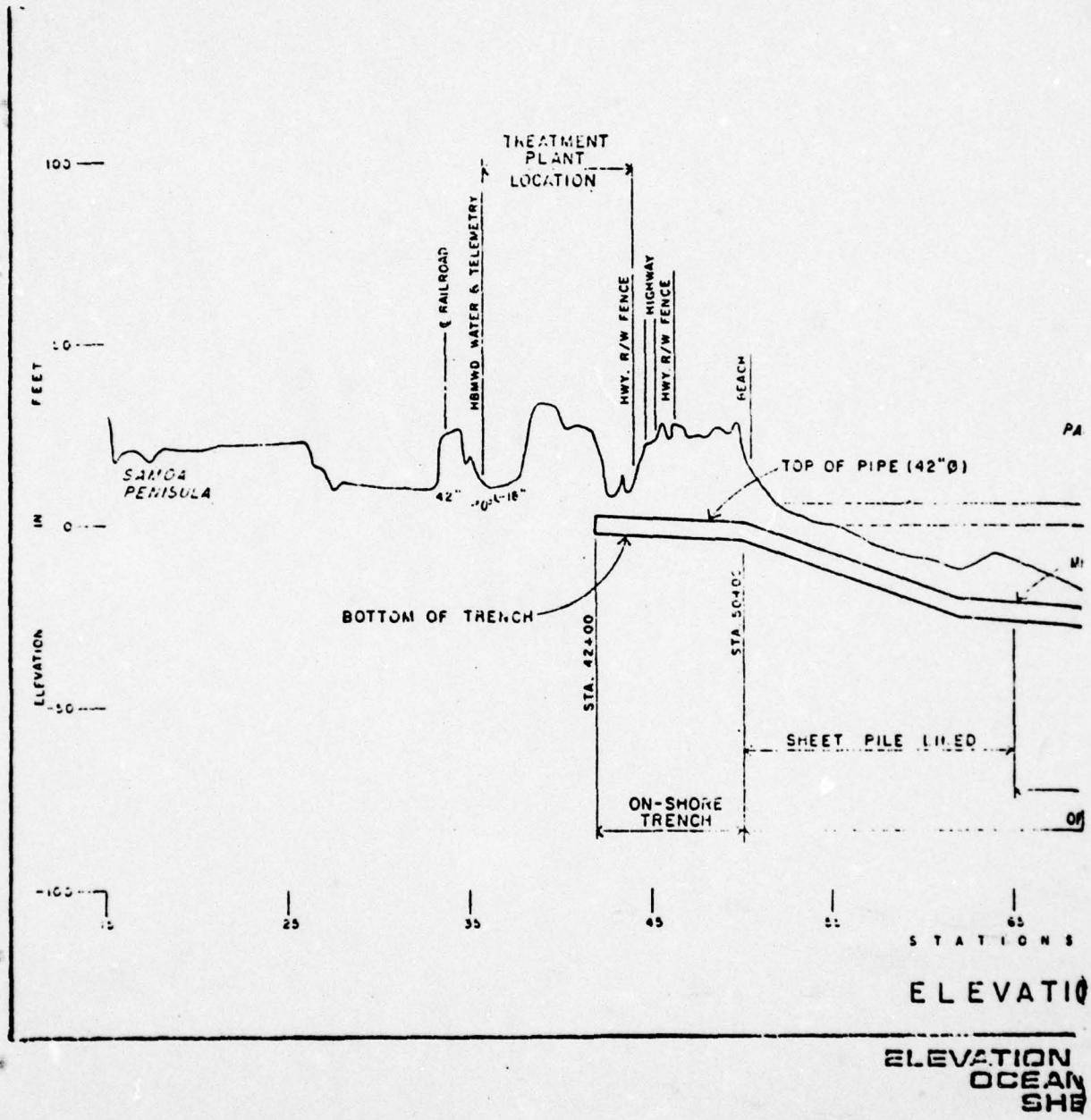
Very truly yours,

WINZLER AND KELLY

Richard Dornhelm

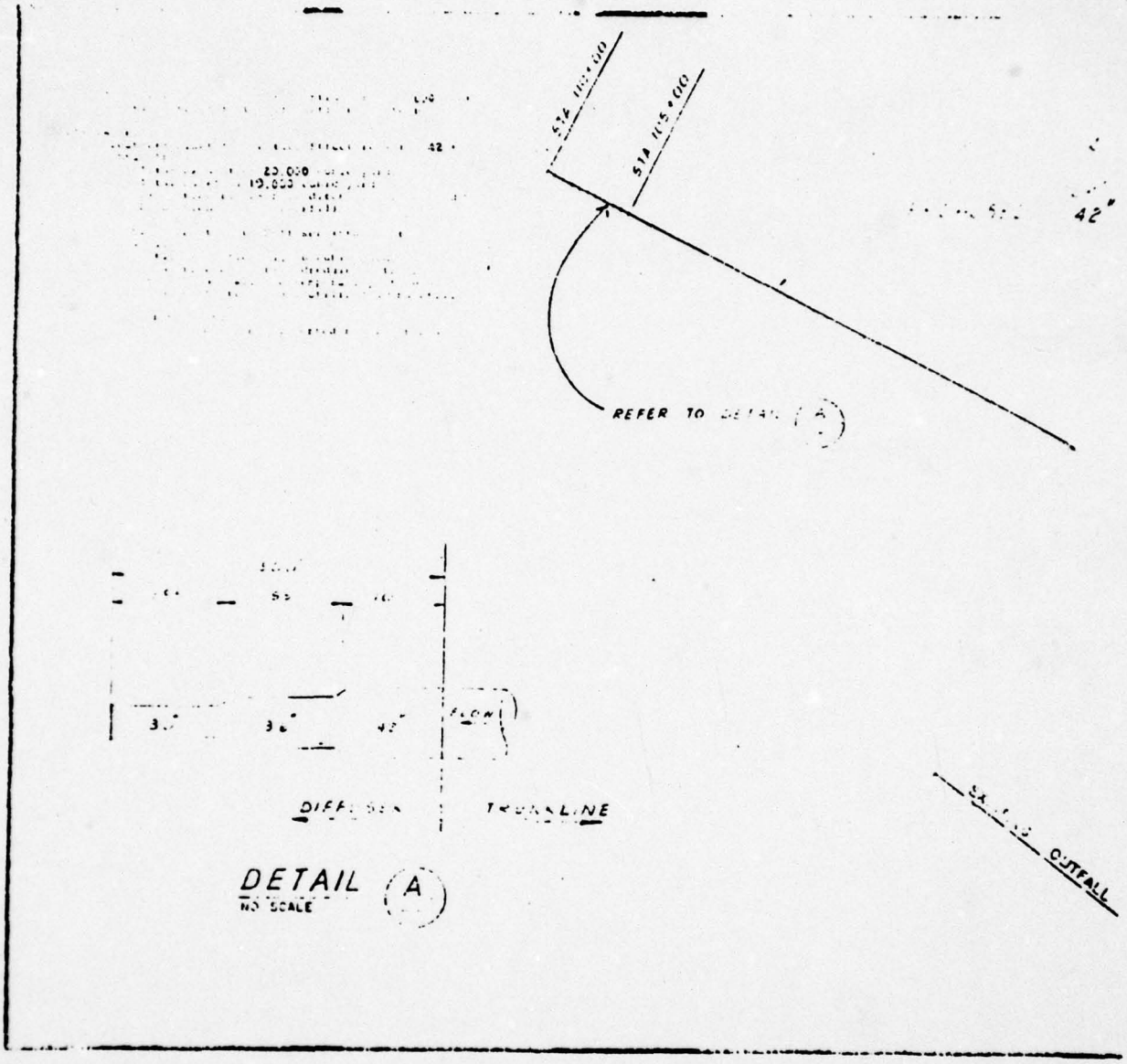
Richard B. Dornhelm

RBD:dlf



ELEVATION
OCEAN
SHE

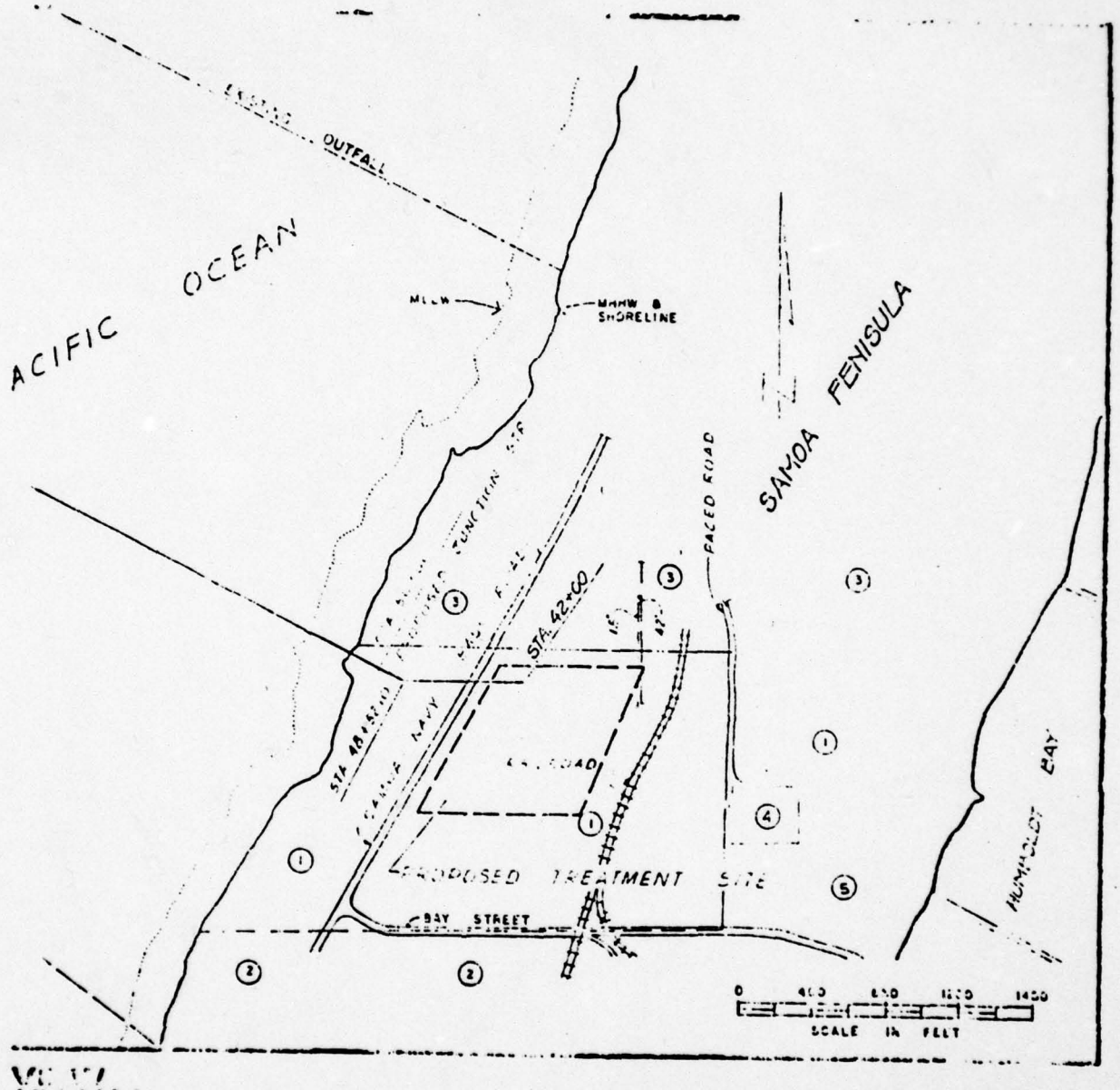
PURPOSE: PROVIDE EFFICIENT WATER POLLUTION CONTROL
DATUM: MEAN LOWER LOW WATER
ADJACENT PROPERTY OWNERS: REFER TO APPENDIX "B"



DETAIL (A)
NO SCALE

PLAT
DIAGRAM
SHE

- PURPOSE: PROVIDE EFFICIENT WATER POLLUTION CONTROL
- DATUM: PLAN LOCATION LOW WATER
- ADJACENT PROPERTY OWNERS:
  1. CHEVRON INTERNATIONAL CORP.
  2. SIMPSON TIMBER COMPANY
  3. LOUISIANA PACIFIC CORP.
  4. PACIFIC GAS & ELECTRIC
  5. NORTH COAST EXPORT CORP.

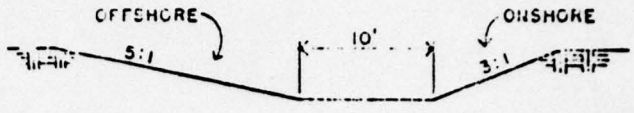


T 9

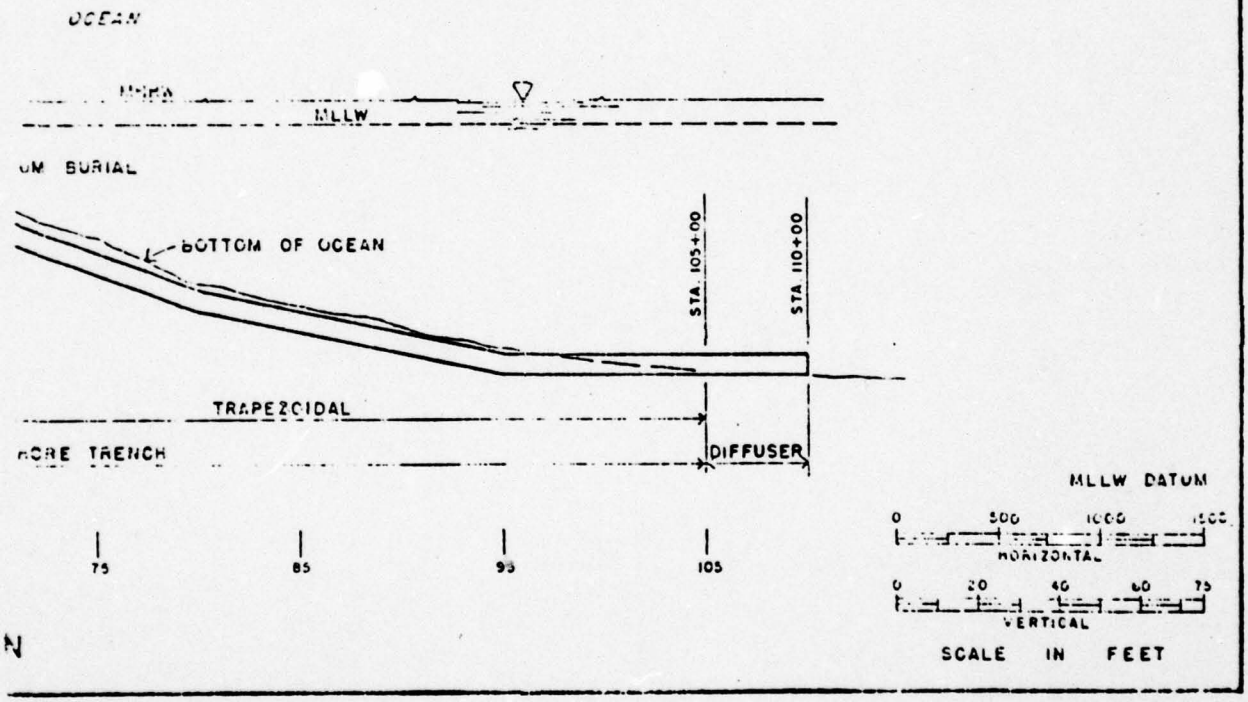
PROPOSED REGIONAL WATER POLLUTION CONTROL PROJECT

IN MID-WESTERN HUMBOLDT COUNTY
STATE OF CALIFORNIA
APPLICATION BY HUMBOLDT BAY WASTE WATER AUTHORITY

SHEET 8 OF 16 SHEETS 1/26/76



SECTION
NOT TO SCALE



N

ND SECTION
DUTFALL
T 10

PROPOSED REGIONAL WATER
POLLUTION CONTROL PROJECT
IN MID-WESTERN HUMBOLDT COUNTY
STATE OF CALIFORNIA
APPLICATION BY HUMBOLDT BAY WASTEWATER
AUTHORITY

SHEET 10 OF 18 SHEETS 1/26/76

INTERNATIONAL LONGSHOREMEN'S &
WAREHOUSEMEN'S UNION
LOCAL 14

7 FIFTH STREET EUREKA, CALIFORNIA PHONE: 442-0490

April 7, 1976

Colonel H. A. Flertzheim, Jr.
U. S. Army Corps of Engineers
San Francisco District
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

We are writing to urge your support on Navigation Design and Harbor Improvements of Humboldt Bay.

Being a Union of Longshoremen who depend 100% on the ships that come into this harbor, we feel that our work opportunity is declining. In 1975 we lost approximately 25% or 38,000 man hours work because the larger freighters cannot sail into the Bay, and cargo is trucked to Coos Bay, Oregon or San Francisco. Most vessels of 27,000 tons dead weight or better cannot top off cargo because of this being a shallow water port.

Therefore, we urge that Humboldt Bay be dredged to 35 feet below Low Tide and turning basins be extended and widened, and that funds be appropriated as soon as possible for a speedy completion.

Our Local Union wants to thank you for any consideration in this matter as it affects others also, such as Loggers, Heavy Equipment Operators, Truck Drivers, etc.

Respectfully yours,

OFFICERS & MEMBERS
ILWU LOCAL 14

Carl Nielsen
President

Carl L Nielsen

CN/cy

Rollin F. dal Piaz
P.O. Box 93
Arcata,
California 95521

8 April 1976

Dr. Richard L. Bailey
Environmental Branch
Engineering Division
U.S. Army Corps of Engineers
100 McAllister Street
San Francisco, California 94102

Dear Dr. Bailey:

Here is a copy of my 7 April 1976 testimony for your use. I have also today forwarded another copy to the Court Reporter here in Eureka who is preparing the hearing record for the Corps of Engineers.

I would be happy to correspond regarding my comments and will make any effort to supply additional data regarding my thesis field study that you might require in writing the final draft environmental statement.

I have contacted local environmentalists concerning the dredge disposal site/birdwatching recreational conflict thru a memo I left with the North Coast Environmental Center today. I will personally speak to Mr. Robert Behrstock and will make certain he gets the message to Audubon and others concerned about specific input to your Branch concerning site design. I feel the only good way to accomplish this is for local concerned citizens to meet with you on the sites. I hope this can be accomplished, perhaps when you are here next week for the Tuesday hearings.

I am looking forward to seeing you at the tuesday hearing concerning Humboldt Bay as I am anxious to express research imperatives, as I perceive them, for our local estuary.

Yours truly,

Rollin F. dal Piaz

RFdP:
file

Rollin F. dal Piaz P.O. Box 93, Arcata, California 95521

8 April 1976

Copy Rollin F. dal Piaz

PUBLIC TESTIMONY
Navigation Channel Improvements
Humboldt Bay, California

The following text is my complete statement for the hearing record on the draft environmental Statement presented at Eureka, California, 7 April 1976 by the U.S. Army Corps of Engineers District, San Francisco. This text is somewhat different and more extensive than my oral presentation.

"I think we are all here tonight as concerned citizens. I know I've other things to do tonight and I'm sure you probably do also...! We are here because we care about Humboldt Bay.

"Before I begin my testimony on the draft environmental statement itself(and I think it is a good statment in most respects), I feel compelled to comment on the statement title. I make this comment as a living being from the shores of Humboldt Bay rather than as a scientist. Humboldt Bay is my home, yourhome and home for many other human beings. It is home for beast and critter beings called animals and it is home for other beings we call plants. Humboldt Bay is an estuary that has been molded into its present form by natural forces, physical and biological. Human organisms, beings of the biological assemblage dependent upon the Bay and its shores, find Humboldt Bay useful as a harbor for commerce. Many human uses are harbor associated. I remind the Corps of Engineers (as I often remind myself)that humanity is not, as was once thought, the end for which all things were formed; it is only a slight feeble thing, perhaps episodic, in the vast stretch of the universe. But for Man, Man is the center of interest and importance(Dewey, 1958, 1960). I can understand that the Corps writer who titled the report was only proclaiming his humanity in the title. It is critical to the present environmental consideration that we keep foremost in our minds the reality that harbor is only one of hundreds of bay uses. In recognition of this vital overall view of nature, the Congress wisely mandated the National Environmental Policy Act...the results are environmental statements like this one and better planned, less environmentally unfortunate projects. If the Corps of Engineers is really sincere about being the environmental agency of the future, I recommend that it should pick a more reasoned, less presumptive and mancentered title for what is otherwise a good draft environmental statement.

"I am a biologist and for the past two years my special interest has been phytoplankton in Humboldt Bay and nearshore Pacific waters. During that period, I spent considerable time on the water both inside and outside Humboldt Bay. Shortly, I will standup for my Master's degree in Biology at Humboldt

State College, partly on the strength of my field work on the summertime dynamics of Humboldt Bay and nearshore ocean waters. I feel my thesis report will represent an important contribution to knowledge of Humboldt Bay.

"An excellent short-term intensive study of the hydrographic structure of north Humboldt Bay is this 'independent study' report by Raymond L. Beittel(B.S. Oceanography, 1975, HSU). I am giving this copy(Beittel,1975)to the Corps tonight because I believe it contains important new information which should be incorporated in the present environmental assessment. I worked with Beittel during a portion of his study and in my opinion his work is equal in quality to any investigation yet completed on Humboldt Bay. Because of his sampling strategy it is probably superior to a study such as Casebier and Toimil(1973)for insight into bay dynamics.

"Next I will discuss specific paragraphs of the draft statement and offer my comments on paragraph content. These following comments are offered from my vantage point as a marine scientist familar with Humboldt Bay waters.

"In paragraph 4.000 A. 1. it is stated that sediment disturbance will result in water quality degradation, an unavoidable adverse consequence for the estuarine environment. Please note that increased turbidity will increase light extinction in the bay water column and decrease the depth of the euphotic zone. It is in the euphotic zone THAT phytoplankton photosynthesis occurs; photosynthesis here is the important first step in marine food chains. I feel the statement should specifically address this impact, even if the impact is expected to be transitory and local. Paragraph 5.000 under unavoidable adverse impacts also mentions turbidity. Because tidal currents are frequently strong in Humboldt Bay, I feel dredging generated turbidity may be a larger problem than indicated in this preliminary assessment. I hope the Corps will make some sort of ongoing turbidity measurements during dredging(perhaps by use of a simple secchi disk)to quantify the persistence and extent of dredging turbidity. Preliminary schedule of dredging calls for activity during months when phytoplankton photosynthesis is an important element in total bay primary productivity(Harding, 1973). The impact of dredging associated turbidity upon phytoplankton cannot be ignored. Some baseline data on bay turbidity is available(Gast and Skeesick,1964; Harding, 1973; Beittel, 1975; dalPiaz, thesis in preparation).

"Paragraph 4.007 assesses benthic impacts on organisms and substrate but I feel impact may extend well beyond the 400 foot wide channel dredging boundary. In my opinion, habitat disturbance due to slumping of bottom sediment into adjacent channels will be considerable until natural hydraulic forces shape the channel boundaries into a new dynamic form. I view the stated need for "Over Dredging" of the channel(mentioned during the 7 April presentation) and the requirement limiting development along channel boundaries as recognition of this

problem. I believe the actual area of benthic disturbance may extend well beyond the actual design boundary of the channel improvements. I would like to see this possibility addressed in the final statement so actual anticipated disturbance of organisms and habitat is adequately assessed.

"Paragraph 4.019 is a discussion of bay tidal prism and salinity. Beittel's study(1975)and my preliminary results show that Humboldt Bay channel waters are not well mixed during the summer months. The pattern we have identified is one of bay waters dominated by solar heating and nearshore waters strongly influenced by upwelling. The intrusion of cooler nearshore waters within bay channels during flood tides pushes warmer bay water (without extensive mixing between cool and warm waters)into the upper ends of the bay. This pattern is in agreement with the pattern identified by Gast and Skeesick(1964)who stated that the character of incoming water and the distance from the bay mouth were two important variables affecting bay waters, specifically physical and chemical characteristics. The recent work(Beittel,1975)was designed with a sampling strategy that enabled a beginning understanding of the variability and extent of nearshore influence upon bay waters.

"Given the new dynamic hydrographic pattern presented by Beittel, the expectation(contained in paragraph 4.019)that the "large volume of water contained in Arcata Bay(would)act to dilute the increased volume of(flood tide)salt water" seems questionable to me. The Arcata Bay water and North Bay channel waters do not seem to mix throughly during each tidal excursion.

"In assessment of impact of deepening the channels, I suggest that the comparison of increase in channel volume(due to dredging the channel bottom five feet)of sea water with the "overall bay capacity " is unfortunate. Based on my present understanding of summertime temperature and water mass distributions in bay channels, I contend that an increase in channel volume should be more properly compared with existing channel volume. Further, I suspect that deepened channels will have quantifiable affects on the flood and slack tide temperature distributions within the channels of Humboldt Bay. This impact may result in consequences for organisms both in the water column and on the bottom. Of course, unless the habitat temperature or water mass movement change is considerable, the tolerance of estuarine organisms for extremes may facilitate natural adjustment by resident plants and animals. It is unfortunate the more is not known about dynamics of physical and biological processes in bay and nearshore waters. I sincerely hope that the Corps will pursue a complete study of Humboldt Bay ecosystems so that future projects as well as ongoing channel maintenance are performed with understanding toward the bay estuarine systems for which we are presently trustees.

"It is that trusteeship that makes all residents along Humboldt Bay shores partners in the management of this important estuarine resource. I certainly want a harbor as a part of our bay system, but I feel that it is only through careful engineering

and environmental study that proper, gentle environmental management will be a reality.

"Thank you for this opportunity to offer my information and personal viewpoint on this important project."

References cited

Beittel, Raymond L. 1975. Hydrographic Structure of North Humboldt Bay. Independent study senior project, Humboldt State University, Department of Natural Resources, Oceanography. Unpublished. (copy supplied to Corps at 7 April meeting by R. dal Piaz). 27 pages.

dal Piaz, Rollin F. 1976. unpublished data: Master's thesis in preparation. Field study Humboldt Bay, May-Sept. 1974 and July-Sept. 1975.

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[redacted]

Gast, James A. and Delbert G. Skeesick. 1964. The circulation, water quality and sedimentation of Humboldt Bay, Calif. Special Report No. 2, submitted to U.S. Atomic Energy Commission. 51pp.

Harding, Lawrence L. 1973. Primary Production in Humboldt Bay. unpublished Master's thesis, Humboldt State University. 55 numbered leaves.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
2828 Chiles Road, Davis, CA 95616

April 12, 1976

H. A. Flertzheim, Jr.
Colonel, CE
District Engineer
Department of the Army
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

We acknowledge receipt of the draft environmental statement concerning Navigation Improvements in Humboldt Harbor and Bay, Humboldt County, California that was addressed to the Soil Conservation Service on March 11, 1976, for review and comment.

We find no conflict with any Soil Conservation Service on-going or planned program or project. We have reviewed the above draft environmental statement and find that there are no controversial items in the statement within the realm of the Soil Conservation Service's expertise and responsibilities.

We appreciate the opportunity to review and comment on this proposed project.

Sincerely,

G. H. STONE
State Conservationist

cc: K. L Williams, Director, WTSC, SCS, Portland, Oregon
R. M. Davis, Administrator, USDA, SCS, Washington, D. C. 20250
Fowden G. Maxwell, Coordinator of Environmental Quality Activities, Office of the Secretary, USDA, Washington, D. C. 20250
Council on Environmental Quality, 722 Jackson Place, N. W., Washington, D. C. 20006 - Attn: General Counsel (5 copies)
Ralph Bishop, AC, SCS, Santa Rosa, California
Fran Morrell, SCS, Eureka, California

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGIONAL OFFICE
50 FULTON STREET
SAN FRANCISCO, CALIFORNIA 94102

OFFICE OF
THE REGIONAL DIRECTOR

OFFICE OF ENVIRONMENTAL AFFAIRS

April 14, 1976

H.A. Flertzheim, Jr., Colonel
C.E. District Engineer
Department of the Army
San Francisco District,
Corps of Engineers
100 McAllister Street
San Francisco, California 94102

RE: Draft Environmental Impact Statement Concerning Navigation Improvements in Humboldt Harbor and Bay, Humboldt County, California

Dear Sir:

The above Draft Environmental Impact Statement has been reviewed in accordance with the interim procedures of the Department of Health, Education and Welfare as required by Section 102 (2) (c) of the National Environmental Policy Act, PL 91-190.

The material provided appears to describe adequately the impacts of the proposed action as well as the alternatives that were presented. The major concerns of this department are related to possible impacts upon the health of the population, services to that population and changes in the characteristics of the population which would require a different level or extent of services. Our review does not identify problems related to these specific concerns.

The opportunity to review this statement was appreciated.

Sincerely,

for James D. Knochenhauer
Regional Environmental Officer

cc: OS/OEA
CEQ

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

April 27, 1976

U. S. Army Engineer District
San Francisco
100 McAllister Street
San Francisco, California 94102

Dear Sir:

This is in reference to your draft environmental impact statement entitled "Humboldt Harbor and Bay, Humboldt County, California." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure Memo from: Mr. Gordon Lill
National Ocean Survey

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Rockville, Md. 20852

Date: April 21, 1976

Reply to Attn of:

Subject: DEIS 7603.47 - Humboldt Harbor and Bay, California

To: Director, Office of Ecology and
Environmental Conservation, NOAA

The National Geodetic Survey does not have any comments on subject draft environmental impact statement, other than the possible impact on monuments of the National Geodetic Control Networks.

Bench marks, triangulation stations, and traverse stations have been established by the National Geodetic Survey in the vicinity of the proposed project. Construction required for the project could result in destruction or damage to some of these monuments.

The National Geodetic Survey requires sufficient advance notification of impending disturbance or destruction of monuments so that plans can be made for their relocation. The National Geodetic Survey recommends that provision be made in the project funding to cover costs of monument relocation.

Gordon Lill
Deputy Director
National Ocean Survey

United States Department of the Interior
FISH AND WILDLIFE SERVICE
1500 N.E. IRVING STREET
P.O. BOX 3737
PORTLAND, OREGON 97208

Reference: ES

Your reference:
SPNED-NN
March 5, 1976

May 4, 1976

Col. H. A. Flertzheim, Jr.
District Engineer
San Francisco District, Corps of Engineers
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

As requested we have reviewed your draft environmental statement for Humboldt Harbor and Bay, California. Our previous letter of April 26, 1976, provided you with our observations on the Draft General Design Memorandum No. 1 for this project and concluded that we had no adverse comments and no objection to commencement of project construction as planned.

Consequently, the following observations relate only to the draft environmental statement and represent only the views of the Fish and Wildlife Service and are not necessarily those of the Department of the Interior since Departmental comments are controlled by the Director, Environmental Project Review under the Assistant Secretary for Program Development and Budget.

General Comments

The document satisfactorily describes fish and wildlife of the project area and with-the-project effects on these resources.

Specific Comments

Page 1, section 1.002: A discussion of postproject maintenance dredging requirements should be included.

Page 7, section 2.010: The reference to exploration holes being made in Humboldt Bay bottom in the project vicinity to study effects of possible sediment movement needs elaboration. A summation of findings would be helpful.

Page 21, section 2.075: This discussion of fish resources is satisfactory. However, sampling techniques should be explained to permit informed judgment relative to gear selectivity. Sampling primarily by trawling in bay channels does not fully disclose ecosystem relationships. This discrepancy need not be corrected but should be acknowledged. West Coast bays function as nursery areas for many species of fish. This aspect of the bay ecology should be emphasized.

Save Energy and You Serve America!

Page 23, section 2.084: Gunther Island has been renamed Indian Island. Black oyster catchers are a relatively scarce bird even in their native coastal habitat; thus, the reference to them is somewhat misleading. Only the double-crested cormorant nests on the Arcata wharf ruins.

Page 23, section 2.087: The southern bald eagle is listed as endangered, not threatened, by the Secretary of the Interior.

Page 47, section 4.000: Some additional impacts of dredging on the shallow portions of the bay are erosion, accretion, and altered circulation.

Page 59, section 4.054: The impact of conveying spoil by pipe from the booster pump barge to the spoil site has not been discussed.

Page 62, section 4.069: Willow-type habitat on the North Spit in the vicinity of disposal site 13C is unique in that it attracts bird species common to only the eastern United States. Site 13C, as presently designed, would eliminate fragments of this habitat type temporarily and perhaps permanently.

Page 73, section 7.001: Does "erosional processes" mean that the dredged spoil will blow or wash away?

Page 73, section 7.002: If the indirect impacts of the project on shallow water portions of the bay are significant, then significant adverse impacts on long-term productivity would seem possible. We suggest this matter be addressed in the text.

Page 74, section 8.003: Evaluational changes may affect the area's capability to sustain temporary wet areas, with associated vegetation types (i.e., willows) and animal populations.

We appreciated the opportunity to review the draft statement and conclude that the proposed project as planned is the correct alternative from the standpoint of fish and wildlife resources.

Sincerely yours,

William H. Meyer

William H. Meyer
Acting Regional Director

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
PACIFIC SOUTHWEST REGIONAL OFFICE
BOX 36062
450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:
D6427

May 5, 1976

Colonel H. A. Flertzheim, Jr.
San Francisco District
U. S. Corps of Engineers
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

The Pacific Southwest Regional Office of the Bureau of Outdoor Recreation has reviewed the draft environmental statement for the proposed Navigation Channel Improvements for Humboldt Harbor and Bay, Humboldt County, California, and finds that the environmental statement adequately discusses matters within our jurisdiction. Please note that the findings of our review do not necessarily reflect the views of the Bureau of Outdoor Recreation or the Department of the Interior.

Sincerely yours,

Frank E. Sylvester
Regional Director

AMERICAN REVOLUTION BICENTENNIAL 1776-1976
RECOGNIZED BY AMERICAN REVOLUTION BICENTENNIAL COMMISSION

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
District Office
855 Oak Grove Avenue
Menlo Park, California 94025

May 5, 1976

Colonel Henry A. Flertzheim, Jr.
District Engineer
San Francisco District, Corps of
Engineers
U.S. Department of the Army
100 McAllister Street
San Francisco, California 94102

Dear Colonel Flertzheim:

We have reviewed the Draft Environmental Statement, "Navigation Channel Improvements Authorized for Humboldt Harbor and Bay, Humboldt County, California," and believe the discussion relating to sedimentation to be adequate.

The foregoing should not be considered as representing a position taken by the Geological Survey and is forwarded as an informal technical review only.

Please direct any requests for additional review and comments to the Director, Office of Environmental Project Review, U.S. Department of Interior, Washington, D. C. 20240.

Very truly yours,

J. W. Wark

for Lee R. Peterson
District Chief

PLANNING DEPARTMENT
COUNTY OF HUMBOLDT
520 "E" STREET EUREKA, CALIFORNIA 95501
PHONE (707) 445-7541

May 7, 1976

Department of the Army
San Francisco District
Corps of Engineers
100 McAllister Street
San Francisco, CA 94102

Subject: Comments on Environmental Statement for Navigational Channel Improvements within Humboldt Harbor and Bay, Humboldt County, California

Gentlemen:

I appreciate the opportunity to comment on the subject report and commend your agency on the thoroughness of the study. Our few comments focus almost exclusively on the land disposal aspects of the project.

COMMENTS:

Under "Relationship of the Proposed Action to Land Use Plans" section 3.005 (pg.46), your report makes the following statement: "The recommended action appears to conform with the recommendations and land use plans outlined in the Humboldt Bay Master Plan (see plate 19) and in the Humboldt County General Plan 2020".

We assume that this "recommended action" includes the project in its entirety, namely, the two principal project components which consists of the dredging operation and the ultimate disposition of the dredged material. If this is the case, this section of your report could be expanded to include relevant textual excerpts from the Harbor Bay Master Plan which more specifically support the "recommended action".

It would also be helpful if the approximate locations of the recommended disposal sites were superimposed on plate 19.

Perhaps if both suggestions given above were incorporated into the revised report the ambigious term "appears to conform" could be replaced with the more positive assertion "The recommended action conforms with the recommendations and land use plan.....".

In conclusion we find your report adequate in its present form. Our comments are intended principally to clarify the relationship between the proposed project and adopted plans.

Very truly yours,

HUMBOLDT COUNTY PLANNING DEPARTMENT

Stanley R. Mansfield
Planning Director

R. London

Robert J. London
Associate Planner

RJL/dp

CC: Ron Holden, CAO
Board of Supervisors
Don Tuttle, Natural Resources Analyst

PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATION, INCORPORATED

~~XXXXXXXXXXXXXXXXXXXXXX~~

3000 Bridgeway, Rm. 102
P.O. Box 1626
Sausalito, CA. 94965

May 7, 1976

H.A. Flertzheim, Jr.
Colonel, CE
U.S. Army Corps of Engineers
100 Mc Allister Street
San Francisco, CA. 94102

Dear Sir:

The Pacific Coast Federation of Fishermen's Association, representing commercial fishermen from Morro Bay to Crescent City, fully supports the Humboldt Bay Harbor Conservation & Recreation District's request for dredging of the bar and inner harbor of Humboldt Bay. For safety, navigation and economic purposes the channel there must be deepened to 35' mean low water.

Eureka is an important port for commercial fishermen on the Pacific Coast. However, important as it may be, commercial fishermen can no longer tolerate the dangerous conditions that exist there. Too many lives and vessels have been lost trying to cross the bar there. Furthermore, because of the shallow waters inside there, making navigation difficult, many fishermen are delivering their catches into other ports. Thus jobs, on the shoreside facilities, are being lost as well.

We would therefore encourage the Corps of Engineers, for the safety, navigation and economic reasons mentioned above, to begin immediately the dredging of the bar and inner harbor of Humboldt Bay. Thank you.

Sincerely,

Zeke Grader

Zeke Grader
General Manager

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Colonel H. A. Flertzheim, Jr., District Engineer
Corps of Engineers
San Francisco District
100 McAllister Street
San Francisco CA 94102

MAY 10 1976

Dear Colonel Flertzheim:

The Environmental Protection Agency has received and reviewed the Draft Environmental Statement for a Navigation-Improvement Project in Humboldt Bay, California.

EPA's comments on the draft environmental statement have been classified as Category Lo-2. Definitions of the categories are provided on the enclosure. The classification and the date of EPA's comments will be published in the Federal Register, in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action, and the adequacy of the environmental statement.

The draft statement notes that Dungeness crab are found in offshore waters. If it is shown that the crabs are likely to be present at SF-3, the impacts resulting from use of the site should be discussed in the final statement, as well as all alternatives to its use. The location of an alternative site in the vicinity of SF-3 that will have less impact on crab populations should be explored.

The draft statement makes no mention of maintenance dredging requirements. The final statement should discuss these requirements including frequency, amount, characterization of material, proposed sites for disposal, and analysis of impact. The final Statement should also indicate how much dredged material is proposed for disposal at site SF-3.

EPA appreciates the opportunity to comment on this draft environmental statement, and requests one copy of the final environmental statement when available.

Sincerely,

Paul De Falco, Jr.
Regional Administrator

Enclosure

cc: Council on Environmental Quality

EIS CATEGORY CODES

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814
(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Navigation and Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
Colorado River Board
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Lands Commission
State Reclamation Board
State Water Resources Control Board
Regional Water Quality Control Boards
Energy Resources Conservation and Development Commission

THE RESOURCES AGENCY OF CALIFORNIA

SACRAMENTO, CALIFORNIA

Colonel H. A. Flertzheim
District Engineer
San Francisco District, Corps of Engineers
Department of the Army
100 McAllister Street
San Francisco, CA 94102

Dear Colonel Flertzheim:

The Design Memorandum No. 1 and the Draft Environmental Impact Statement for Navigation Channel Improvements in Humboldt Harbor and Bay, which you submitted to the Office of Planning and Research (State Clearinghouse), have been reviewed by the state agencies concerned. This review fulfills requirements under Part II of the U. S. Office of Management and Budget Circular A-95, and the National Environmental Policy Act of 1969.

The reports have been reviewed by the Departments of Fish and Game, Food and Agriculture, Health, Navigation and Ocean Development, Parks and Recreation, Transportation, and Water Resources; the Energy Resources Conservation and Development Commission; the Public Utilities Commission; the State Lands Commission; the Air Resources Board; the Solid Waste Management Board; and the State Water Resources Control Board.

The project will include the removal of 2,400,000 cubic yards of material from the major navigation channels in order to increase the depth from 30 feet to 35 feet. We do not believe that the removal of an additional five feet is likely to have an adverse effect on local ground water supplies. However, we are concerned with potential water quality problems which may result from the disposal of dredged material on Samoa Peninsula.

Recommendation

The final EIS should contain revisions responding to specific comments listed on page 2.

General Comments

The proposals for handling dredged material by utilizing ocean dumping, land disposal, and possibly a limited amount of ocean beach disposal, meet with the approval of the staff of the California Regional Water Quality Control Board, North Coast Region. Specific features and control measures necessary to meet water quality requirements will be reviewed and evaluated in connection with design plans prepared by the Corps of Engineers.

Specific Comments

1. The discussion and presentation of bulk sediment analyses (Paragraph 2.017 and Appendix 11) make reference to 1973 Environmental Protection Agency dredged spoil disposal criteria which have since been revised. Dredge Material Disposal Criteria - Revision 1 (November 1975) are the applicable regulations which should be included for comparison with the results of sediment analyses.

2. The EIS states that the ground water under North Spit could be degraded and might affect the water supply of eight homes. As a mitigation measure, we recommend that the Corps of Engineers monitor ground water quality of the eight wells during and following the dredging operations. If the ground water quality is significantly degraded by the saline spoil, we believe that the Corps should accept responsibility for the cost of connecting the eight homes to the existing water distribution system. As a cost-competitive alternative mitigation measure, the Corps could consider paying the cost of connecting the eight homes to the existing water distribution system; then there would be no monitoring or other follow-up costs.

Thank you for the opportunity to review this material.

Sincerely,

CLAIRE T. DEDRICK
Secretary for Resources

By

cc: Director of Management Systems
State Clearinghouse
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(SCH No. 76032206)

IN REPLY REFER TO:
1790

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

District Office
555 Leslie Street
Ukiah, California 95482
Telephone (707) 462-3873

MAY 18 1976

Richard L. Bailey, Ph.D.
U.S. Army Corps of Engineers
Engineering Division, Environmental Branch
100 McAllister Street
San Francisco, California 94102

Dear Dr. Bailey:

Thank you for the opportunity to review the environmental statement for navigation improvement of Humboldt Harbor and Bay. This proposed action will have no direct impacts on national resource land, therefore, our few comments will be limited to adequacy of the statement.

Our general impression is favorable. The description of the environment has some material unrelated to impacts but the essential items are covered. The impacts section is straightforward and complete with the exception of one wildlife item. This is a very important coastal resource and your conclusions with respect to it will be examined very closely. The item needing correction or further discussion is as follows:

> Use of the term "barren sand dunes" (pages 3 and 59) is misleading. Although usually not visible, life forms do exist in bare sand. Habitation by lower forms and hunting or access by higher forms are common uses. There is a definite inconsistency in the statement on page 3 about minor impacts on habitat and the loss of animals statement on page 59.

If further elaboration is needed, please contact us again.

Sincerely yours,

Melvin D. Clausen

Melvin D. Clausen
District Manager

United States Department of the Interior

NATIONAL PARK SERVICE

WESTERN REGION

450 GOLDEN GATE AVENUE, BOX 36063

SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:

L7619

(WR)REQ

May 26, 1976

Mr. H. A. Flertzheim, Jr.
District Engineer
Corps of Engineers
100 McAllister Street
San Francisco, California 94102

Dear Mr. Flertzheim:

We have reviewed the Draft General Design Memorandum and the Draft Environmental Impact Statement for the Navigation Improvement Project in Humboldt Bay, California. The following comments are provided for your technical assistance only and do not represent formal review comments from the Department of the Interior.

Neither the discussion of the archeological surveys given on page 35 nor the discussion of the impacts on pages 52 and 62 of the draft statement and pages 42 and 44 of the draft design memorandum makes any reference to the pipelines to be used to carry the dredged materials to the disposal sites and the drainage ditch and pipeline pictured in figure 4 of the draft design memorandum. These areas should be in the survey of the contingency beach disposal site, which will be performed before the final statement is released.

Further, we are unable to judge the adequacy of the archeological surveys mentioned on page 35 of the draft statement. No indication is made of the intensity of the survey, nor the precise location of the area covered by the survey. This information, along with the name of the qualified professional individual or institution who conducted the survey, should be included in the final statement.

In light of the potential for buried or obscured sites in the disposal site areas mentioned on page 35, we recommend that a competent professional archeologist familiar with the situation in the project area be consulted regarding whether or not the use of an exploratory back hoe across the disposal sites would be advisable.

Copies of any archeological reports should be made available to the Western Archeological Center, P. O. Box 49008, Tucson, Arizona 85717.

We hope these comments will be helpful in the future preparation of this environmental statement.

Sincerely yours,

Bruce M. Kilgore

Bruce M. Kilgore
Associate Regional Director,
Resource Management and Planning

STATE OF CALIFORNIA
EDMUND G. BROWN, JR. Governor
RONALD REAGAN Governor

CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION
NORTH COASTAL REGIONAL COMMISSION
1656 UNION STREET, ROOM 150
P. O. BOX 4946
EUREKA, CALIFORNIA 95501
(707) 443-1623

Mr. Dick Baily
Army Corps of Engineers
100 McAllister Room 711
San Francisco, California 94102

Comments on paragraph 4.074 on page 62 would also be similar.

The latest information I have concerning rare and endangered plants is that the rare and endangered plant mentioned above is going to be added to the Federal Register of Threatened or Endangered Fauna or Flora which is dated July 1, 1975.

Policy 26 of the Coastal Plan calls for the protection and restoration of rare and endangered plants and habitat types. If the dredge spoil site has this rare and endangered plant on it, the Coastal Plan policy would be not to permit this site.

The statements in paragraphs 3.001, 3.002, and 3.003 on page 46 are a misinterpretation of Coastal Plan Policies. Dredging, marinas, port facilities, etc. are coastally dependent, however, the placement of dredge spoils is <u>not</u> coastally dependent, that it does not have to be placed on land adjacent to the bay.

You mention policy 26 in the Coastal Plan as referring to fragile habitats. Actually policy 27 is the policy that refers to these fragile areas.

Paragraph 4.055 on page 59 states there would be a loss of resident species in the disposal area. It doesn't mention that the loss of this habitat will also affect migratory species.

Paragraph 4.056 on Page 59 states that the dredge spoils would make it easier to develop this area. This area, as recommended by the Coastal Commission, should remain undeveloped and kept in open space.

Appendix 8 is somewhat misleading in that you have ommitted the Casual and Accidental bird records in this appendix. There are approximately 34 species of birds in these two catagories that have been recorded on the spoils site or similar habitat along the North Spit. This shows the extreme importance of this habitat type. For further information on bird species recorded on or near this site, you should contact Dr. Stanley W. Harris at Humboldt State University.

STATE OF CALIFORNIA

RONALD REAGAN, Governor

CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION
NORTH COASTAL REGIONAL COMMISSION
1656 UNION STREET, ROOM 150
P. O. BOX 4946
EUREKA, CALIFORNIA 95501
(707) 443-1623

May 28, 1976

Mr. Dick Baily
Army Corps of Engineers
100 McAllister Room 711
San Francisco, California 94102

Dear Mr. Baily:

In our telephone conversation last week, I mentioned some of the Coastal Commission staff's concerns about the Army Corps of Engineers dumping dredging spoils on the property next to the City of Eureka's airport on the Samoa Penninsula.

GENERAL COMMENTS:

Our concerns are similar to those expressed by the U.S. Fish and Wildlife Service. These low spots among the dunes support healthy stands of willows and other water tolerant species which are extremely important to various species of wildlife. If these areas are chosen by the Corps to deposit the dredge spoils, the runoff and drainage from the spoils should be designed in such a manor as to not enter these low areas containing the willows. As you know, the salt water coming from the dredge spoils would kill the vegetation, thereby severly reducing its value for wildlife species

After reviewing slides and other pictures of the proposed spoils dump site, it seems that we would have very few concerns for site 13 B and the western half of area 13 C as far as willow habitat is concerned. However, it appears that the eastern half of area 13 C contains portions of this important willow habitat type.

Although we would probably prefer the offshore dumping of dredge spoils, we realize this adds quite a considerable cost to the project. I feel we could work out the exact boundaries for the dredge spoil areas by walking the property with a member of your staff and delineating the portions of areas 13 B and 13 C that we would be most concerned with.

SPECIFIC COMMENTS:

On page 23, paragraph 2.088, states that there are no rare and endangered vascular plants in this area. Even though the Inventory of Rare and Endangered Vascular Plants of California did not mention the fact that Erysimum menziesii is found in the Eureka quadrangle map, I believe Humboldt State University has specimens of this species and were collected close to, if not on the area proposed for the dumping of dredge spoils. It is also listed in appendix two of this report. For further information on this matter, you should contact either Dr. John Sawyer or Dr. James P. Smith of the Botany Department at Humboldt State University.

Comments on paragraph 4.402 on page 57 would be similar to the above paragraph.

STATE OF CALIFORNIA

EDMUND G. BROWN, JR. RONALD REAGAN, Governor

CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION
NORTH COASTAL REGIONAL COMMISSION
1656 UNION STREET, ROOM 150
P. O. BOX 4946
EUREKA, CALIFORNIA 95501
(707) 443-1623

Mr. Dick Baily
Army Corps of Engineers
100 McAllister Room 711
San Francisco, California 94102

I am sure you are aware of the fact that a permit to deposit these dredge spoils on these sites will require a permit from the Coastal Commission.

Thank you for the opportunity to review this report. We will be looking forward to working with you on this particular project.

Yours truly,

Wayne Woodroof

Wayne Woodroof

WW:lp

cc: Dr. S. Harris
Dr. J. Sawyer
Dr. J. Smith
F. Smith U.S. Fish & Wildlife Service
G. Monroe California Dept. of Fish & Game

2 June 1976

Mr. Wayne Woodroof
California Coastal Zone Conservation Commission
North Coastal Regional Commission
1656 Union St., Room 150
Eureka, California 95501

Dear Mr. Woodroof:

In answer to recent inquiries from the Regional Commission, Erysimum menziesii (Hook.) Wettst. does occur on the dunes north of the Coast Guard Station on the Samoa Peninsula. We have several specimens in the Humboldt State University Herbarium documenting its distribution through the area. The specimens were collected over a period of several years, but do include very recent collections.

When I attended the mapping session for the California Native Plant Society Rare and Endangered Plants Project, it became apparent to me after talking with some other participants that our populations of this species were the best remaining ones in California. Although the standard literature states that the species occurs down the coast, other botanists had not seen any plants or knew of only limited numbers.

I am unable to explain why these populations on the Samoa dunes were not mapped on the Eureka quadrangle map. Its presence there is well known.

The possible destruction of suitable habitats for Erysimum menziesii on the Samoa dunes causes me great concern. These sites may well be among the last where the species still flourishes.

Sincerely yours,

J P Smith

James Payne Smith, Jr.
Associate Professor of Botany
Director of the Herbarium

cc: Dick Bailey

HUMBOLDT STATE UNIVERSITY • Arcata, California 95521 • (707) 826-3245

DEPARTMENT OF BIOLOGY

3 June 1976

Mr. H. E. Pape, Jr.
Chief, Engineering Division
Department of the Army
San Francisco District, Corps of Engineers
100 McAllister Street
San Francisco, CA 94102

Dear Mr. Pape:

Thomas Nelson, our Herbarium Botanist, turned over to me your letter of 25 May 1976 for answering because I have been in contact with the local Coastal Commission. I am taking the liberty of sending you a copy of a recent letter pertaining to the occurrence of rare and endangered vascular plants on the Samoa Peninsula.

Now having seen a copy of the Environmental Statement, it appears to me that there is little doubt as to the occurrence of Erysimum menziesii (Hook.) Wettst. in Disposal Site 13C and probably in Site 13B. Several specimens on deposit in the Humboldt State University Herbarium and recent field observations provide documentation. I doubt that the endemic Orthocarpus castillejoides Benth. var. humboldtiensis Keck occurs on the proposed disposal sites. It is a salt marsh plant.

These local populations of Erysimum menziesii may well be the last in California where the species still flourishes.

Sincerely yours,

J P Smith

James Payne Smith, Jr.
Associate Professor of Botany
Director of the Herbarium

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-76/576

JUN 14 1976

Dear Colonel Flertzheim:

The Department of the Interior has reviewed the draft environmental statement and general design memorandum for Humboldt Harbor and Bay, California. We have the following comments on the draft statement for your consideration.

General Comments

The document adequately discusses matters of concern to the Department's Bureau of Outdoor Recreation and Geological Survey. Also the document satisfactorily describes fish and wildlife of the project area and project effects on these resources.

Specific Comments

Page 1, Section 1.002: A discussion of postproject maintenance dredging requirements should be included.

Page 7, Section 2.010: The reference of exploration holes being made in Humboldt Bay bottom in the project vicinity to study effects of possible sediment movement needs elaboration. A summation of findings would be helpful.

Page 21, Section 2.075: This discussion of fish resources is satisfactory. However, sampling techniques should be explained to permit informed judgment relative to gear selectivity. Sampling primarily by trawling in bay channels does not fully disclose ecosystem relationships. This discrepancy need not be corrected but should be acknowledged. West Coast bays function as nursery areas for many species of fish. This aspect of the bay ecology should be emphasized.

Page 23, Section 2.084: Gunther Island has been renamed Indian Island. Black oyster catchers are a relatively scarce bird species

even in their native coastal habitat; thus, the reference to them is somewhat misleading. Only the double-crested cormorant nests on the Arcata wharf ruins.

Page 23, Section 2.087: The southern bald eagle is listed as endangered, not threatened, by the Secretary of the Interior.

Page 35: Neither the discussion of the archeological surveys given on this page nor the discussion of the impacts on pages 52 and 62 of the draft statement and pages 42 and 44 of the draft design memorandum makes any reference to the pipelines to be used to carry the dredged materials to the disposal sites and the drainage ditch and pipeline pictured in Figure 4 of the draft design memorandum. These areas should be in the survey of the contingency beach disposal site, which will be performed before the final statement is released.

Further, we are unable to judge the adequacy of the archeological surveys mentioned on this page. No indication is made of the intensity of the survey, nor the precise location of the area covered by the survey. This information, along with the name of the qualified professional individual or institution who conducted the survey, should be included in the final statement.

In light of the potential for buried or obscured sites in the disposal site areas, we recommend that a competent professional archeologist familiar with the situation in the project area be consulted regarding whether or not the use of an exploratory back hoe across the disposal sites would be advisable.

Copies of any archeological reports should be made available to the Western Archeological Center, P. O. Box 49008, Tucson, Arizona 85717.

Page 47, Section 4.000: Some additional impacts of dredging on the shallow portions of the bay are erosion, accretion, and altered circulation.

Page 59, Section 4.054: The impact of conveying spoil by pipe from the booster pump barge to the spoil site has not been discussed.

Use of the term "barren sand dunes" (pages 3 and 59) is misleading. Although usually not visible, life forms do exist in bare sand. Habitation by lower forms and hunting or access by

higher forms are common uses. There is a definite inconsistency in the statement on page 3 about minor impacts on habitat and the loss of animals statement on page 59.

Page 62, Section 4.069: Willow-type habitat on the North Spit in the vicinity of disposal site 13C is unique in that it attracts bird species common to only the eastern United States. Site 13C, as presently designed, would eliminate fragments of this habitat type temporarily and perhaps permanently.

Page 73, Section 7.001: Does "erosional processes" mean that the dredged spoil will blow or wash away? This should be further discussed.

Page 73, Section 7.002: If the indirect impacts of the project on shallow water portions of the bay are significant, then significant adverse impacts on long-term productivity would seem possible. We suggest this matter be addressed in the text.

Page 74, Section 8.003: Evaluational changes may affect the area's capability to sustain temporary wet areas, with associated vegetation types (i.e., willows) and animal populations.

We hope these comments will assist you in preparation of the final statement.

Sincerely yours,

Stanley K. Sorensen

Deputy Assistant Secretary of the Interior

Colonel H. A. Flertzheim, Jr.
District Engineer
San Francisco District, Corps of Engineers
100 McAllister Street
San Francisco, California 94102

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services
2800 Cottage Way, Room E-2727
Sacramento, California 95825

July 21, 1976

Colonel H. A. Flertzheim, Jr.
District Engineer
San Francisco District, Corps of Engineers
211 Main Street
San Francisco, California 94105

Dear Colonel Flertzheim:

In connection with the Humboldt Harbor and Bay channel deepening project, your staff recently became aware of the occurrence of a rare plant, Menzie's wallflower (Erysimum menziessi), in the vicinity of the north spit spoil disposal sites. The Resource Agency of California has expressed concern for this particular plant as it is considered to be endangered by some groups. It is not, however, presently under consideration for inclusion in the forthcoming United States List of Endangered Flora. Thus, we do not anticipate that the provisions of the Endangered Species Act of 1973 will apply to the channel project insofar as Menzie's wallflower is concerned. This plant is, nonetheless, of very limited geographic distribution and every reasonable consideration should be given to its protection. Please advise if there is any way we may assist your project planners toward that end.

Sincerely,

James D. Carson

James D. Carson
Acting Field Supervisor

cc: ARD-Env (ES), USFWS, Portland

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services
2800 Cottage Way, Room E-2727
Sacramento, California 95825

Colonel H. A. Flertzheim, Jr.
District Engineer
San Francisco District, Corps of Engineers
211 Main Street
San Francisco, California 94105

July 28, 1976

Dear Colonel Flertzheim:

Our letter of July 21, 1976, concerning the Humboldt Harbor and Bay channel deepening project and the effect of spoil deposition on Menzie's wallflower (Erysimum menziessi) requires correction. Whereas the plant is not currently under consideration for classification as an Endangered species (as stated in our previous letter), it could quite possibly be designated a Threatened species. The provisions of section 7 of the Endangered Species Act of 1973 apply to each classification.

A list of plants proposed for designation as Endangered was published in the Federal Register on June 16, 1976. A list of plants proposed for designation as Threatened is in preparation but has not yet been published in the Register. It is our understanding that the list of proposed Threatened species, when published, will likely include Menzie's wallflower. As we understand the provisions of the Act, the channel deepening project could not be constructed--as now planned--if it is determined that spoil deposition or other project activity would jeopardize the continued existence of any Endangered or Threatened plant, as a species, or result in the destruction or modification of habitat of such species when determined by the Secretary of the Interior to be critical habitat.

In view of present circumstances, we urge the Corps of Engineers to give full consideration to alternate spoil sites and recommend that as much information as possible be assembled concerning the status of Menzie's wallflower to permit a sound judgment with respect to anticipated project impacts on the species. Your staff has indicated to us that these matters will be addressed in the Final Environmental Impact Statement.

Please advise if further clarification is required.

Sincerely,

James D. Carson

James D. Carson
Acting Field Supervisor

cc: ARD-Env (ES), USFWS, Portland, OR

THE WILDLIFE SOCIETY
FOUNDED 1937
HUMBOLDT CHAPTER
Humboldt State University
Arcata, California 95521

U.S. Army Engineer District, San Francisco
100 McAllister Street
San Francisco, California 94102

Gentlemen,

The Wildlife Society thanks you for the oppurtunity to comment on the draft Environmental Impact Statement of the Navigation Channel Improvement for Humboldt Harbor and Bay. We have reviewed this plan and wish to enter these comments into the record.

It is difficult to interpret the planning map due to lack of adaquate coordinates. Further, the plan inadaquatly treats the effect of future maintainance operations, both economically and environmentally.

Realizing that the Corps of Engineers undoubtedly will dredge the bay we offer the following suggestions. While the exact location is unclear on the map, we presume the turning basin will be located in the deeper water due East of the Samoa stack. If this is true we commend you for locating a site which requires the least amount of dredging. We suggest a maximum effort to reduce dredging of the Gunther Island mudflat.

From the data, it seems that using the Hopper dredge alternative is the most economical both in time and money. Since the objectives of this project are to stimulate the economy, this method would require the least outlay by the local populace. Additionally, the shorter time required by this method might reduce detrimental effects on the breeding cycles of bottom dwelling organisms.

Most of the proposed North Spit disposal sites have several disadvantages. Material disposed of at site 17 probably will have to be removed from the entrance channel at a future date. Spoil deposition at site 13-B would destroy habitat utelized by non-western transient birds. Deposition at site 13-B and site 13-C would encourage commercial developement of this and neighboring areas, to the detriment of ex-

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HUMBOLDT CHAPTER
Humboldt State University
Arcata, California 95521

isting esthetic values. Furthermore, the prevailing winds will carry unpleasant odors to the city of Eureka.

These problems need not be considered if the Hopper dredge and an ocean dump site are utilized.

Appendix 7 (pages 7-1 and 7-2) lacks a complete list of marine nearshore mammals. It should include Eumetopias jubata (Stellar's Sea Lion), Phocoena phocoena(Harbor Porpoise), and Eschrichtius gibbosus(Gray Whale). Despite the statement to the contrary, the Stellar's Sea Lion and the Gray Whale are associated with the nearshore, and the Harbor Porpoise frequents both the bay and the nearshore.

In conclusion we request that the Corps of Engeneers seriously reconsider the use of the Hopper dredge method. Please forward us a copy of the final draft of the Environmental Impact Statement. Thank-you very much for your consideration.

Sincerely,
Howard Levinson
Howard Levinson
President

Redwood Region Audubon Society

P. O. BOX 1054 EUREKA, CALIFORNIA 95501

Dept. of the Army
San Francisco District
Corps of Engineers
100 McAllister St.
San Francisco, CA 94102

Dear Sirs:

The Redwood Region Audubon Society is concerned over habitat destruction which will result from dredge fill to be deposited on the North Spit of Humboldt Bay. Wetland and riparian habitat surrounding Humboldt Bay have been decreasing steadily due to construction, diking and filling. The southern portion of North Spit is a fragile area composed of dunes interspersed with riparian habitat. Stands of willow can exist among these dunes because they grow in low areas (swales) where adequate moisture exists. The plan as it now reads is to cover much of this fragile habitat with bay sediments. Reseeding these sediments in the future will not restore the typographic features of the dunes, nor will it restore the native vegetation growing in what will soon be rare areas around Humboldt Bay. This appears to be a non-mitigatable habitat loss, and should be condidered very carefully before dumping begins.

We are also concerned about other willow and marsh areas adjacent to the primary and secondary deposit sites. A valuable recreation and wildlife study area exists adjacent to the Fairhaven Airport. We can account for several thousand hours spent in the field during the last decade in this area. Numerous important ornithological finds have been made in this area. Aquatic plants, and reptiles are also studied in the same vicinity. We fear that salt leaching from the adjacent dredge piles may kill stands of vegetation outside the actual dump sites. We suspect that marsh vegetation will be killed due to salt leaching, with, of course, no guarantee that the marshes will ever have the capacity to regenerate.

We recommend that materials from hopper dredge operations at the mouth of the Bay be dumped on South Spit which is a less fragile area. Furthermore, South Spit is in the process of being eroded away by wind and water, and bay sediments might help stabilize areas currently being modified by unfavorable nearshore processes.

We are concerned about the nature of the vegetation which will replace the dunes, as it cannot substitute for the highly adapted native vegetation in terms of soil stabilization or habitat for the native animals. We are also suspicious that the dredge may not, in fact, become stabilized and may form a high and dry hill of fine poorly consolidated sediments which could eventually become a vast shifting dune blowing onto the beach, airport, Coast Guard Station, road, and even perhaps ending up in the Bay again.

For these reasons, we cannot consider the dumping of Humboldt Bay deposits

Redwood Region Audubon Society

P. O. BOX 1054 EUREKA, CALIFORNIA 95501

at the primary or secondary dump sites to be an ecologically sound proceedure. We strongly recommend finding alternate sites for the dumping of dredge materials where less ecological impact will be felt, especially in areas not included in the dump sites but none-the-less subject to serious habitat alteration or degregation from the presence of salt laden dredge materials. We feel that scarce and valuable habitats should not be included in spoil sites for this or similar projects. We also recommend that sites on South Spit be utilized as much as possible to reduce habitat damage.

We thank you very much for giving us the opportunity to express these views.

Sincerely,

Robert A. Behrstock

Robert A. Behrstock
Secretary-Redwood
Region Audubon Society

cc: North Coast Environmental Center